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## Latest Design of Buckeye Engine.

The engravings on this page represent the latest design of the Buckeye engine, built by the Buckeye Engine Company, Salem, Ohio. The principal novel feature in the design as here presented is in the bed-plate, although it should be added that during the past year or two the details of the engine have been thoroughly gone over, and such changes as have been suggested by previous practice have been made. The new bed is of neat design, and has a large weight of metal judiciously distributed to resist strains. It rests on the foundation on large connected surfaces, and is particularly adapted for high speed, if desired, and for heavy loads. The engravings present a truthful view of the general form of this bed. It is made with either quarter adjusting boxes or the angular pillow block, so long a feature of these engines, according to the wishes of customers.

One of the important characteristics of the Buckeye engine is the balanced, or rather relieved, slide valve, which runs under sufficient pressure to insure clean wearing surfaces, without cutting or material wear. These valves are fitted by scraping from indication of bearing points while under full steam, and hence while under the same condition as when the engine is in operation. The condition of the valve, as to leakage, can also be readily noted by the engineer at any time.

The peculiar motion which the cut-off valve receives through the compound rock shaft brings about cut-off, whether early or late, very near the middle of travel of valve, where the motion is the quickest; hence the cut-off is sharp, and any slight derangement from wear is not noticeable. The cut-off is close to the bore of the cylinder, reducing clearance to the minimum. The cut-off has a wide range—under ordinary conditions up to about three-quarters stroke—this entire range being at all times under complete control of the governor.

The eccentric, where embraced by the strap, is turned of a spherical form, being the central section of a perfect sphere, so that the operation is that of a ball and socket connection, working equally satisfactorily if the alignment becomes deranged. The fixed or main eccentric is held to the shaft by means of a toothed block, adjusted by a wedge operated by a nut. This makes adjustment of the eccentric for lead and compression an easy matter.

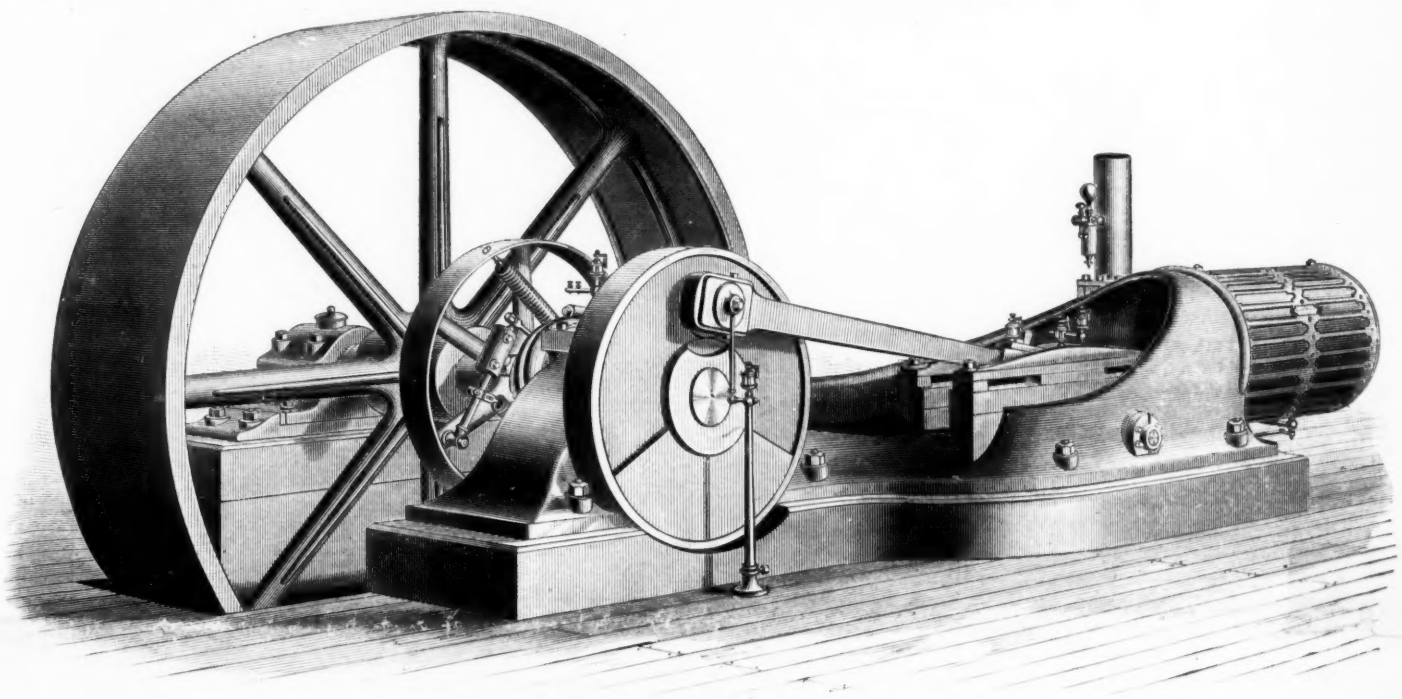
The drop hook is fitted with a composition spool or sleeve, which is made in halves, and which can at any time be tightened to the pin to compensate for wear. The continuation of the handle of the hook is threaded, and so arranged that a half-turn forces the point beyond the thread into a corresponding countersink in the spool, thus securely holding the hook in place and taking up all lost motion. These features relieve the hook of the greatest objection to its use, viz.: disagreeable lost motion not easily remedied.

The construction of the governor, with its positive connection with cut-off valve, not dependent upon belt or gears, is too well known to require description.

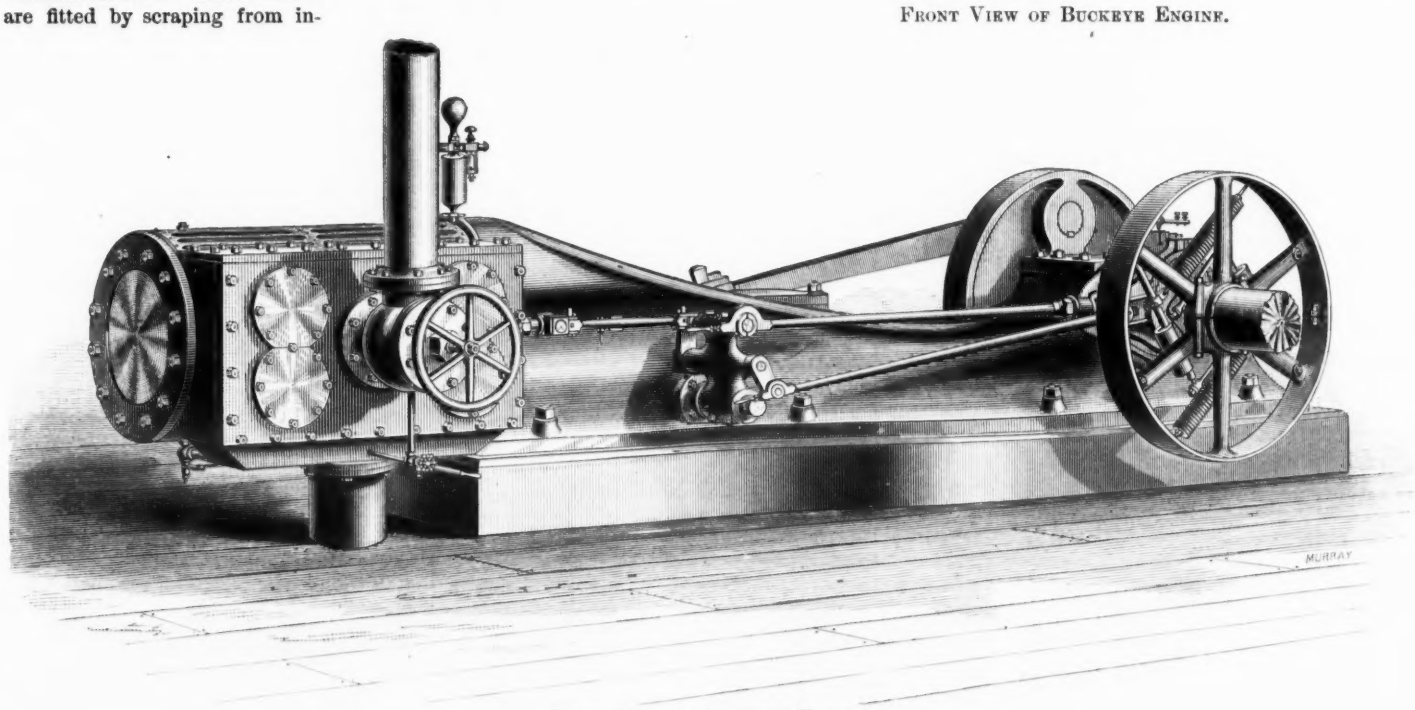
A neat arrangement of sight feed for the crank-pin is shown in the engraving. An improvement in this over that formerly used on the Buckeye engine is in making the ball through which the oil is fed a shell, so that if for any cause the sight feed fails to work, oil can be injected from an oil can.

Sight feed is also provided for the main journal and eccentrics, by using a central column screwed to the bed-plate, with branches to these bearings, provided with needle regulation. This places the oiling of all principal wearing surfaces under the eye of the operator, enabling him to know the exact quantity of oil going to each. The oiling arrangement is a very neat one and conducive of economy.

Geo. A. Barnard, 69 Astor House, New York, is the eastern sales agent for these engines.



FRONT VIEW OF BUCKEYE ENGINE.



BACK VIEW OF BUCKEYE ENGINE.

## Sheep Shearing Machine.

A machine is reported to be in use in Melbourne for shearing sheep by steam. It is made of brass, something in the shape of a small trowel. The motion is got up by a turbine wheel about three inches in diameter, and this is geared into another wheel, on which is fixed a cutter; in front is a comb, which serves as a guard against cutting the skin of the sheep. The steam is conveyed from the boiler by a tube of India rubber. This tube or pipe is double, having one inside the other. The inner one is the injection, and the space between the two is the ejection. The machine is used in the same fashion as the shears, but cuts much quicker and far cleaner, without the least danger of injuring the fleece of the sheep. The conditions surrounding industry in Australia are similar to those in the United States, and it is natural that the colonists should develop a tendency to invent tools and machinery for their special needs. In the course of a few years we expect to hear a good deal more about Australian inventions than we have been in the habit of learning about, because there will be more of them to mention. New countries feel the need of inventions to suit their own circumstances one of which generally is shortness of labor. Scheming to produce something that will aid human labor and take from man the heaviest toil, has brought high success to the American inventor, and the same race of men in Australia will make their mark as inventors.

## Expiring Pipe Cutter Patents.

BY F. B. BROCK, WASHINGTON, D. C.

William S. Howarth, of New Haven, devised a tool for cutting pipe, shown in the illustration. The patent expired last year.

In this tool three revolving plain cutters are employed, having their three axes or centers of rotation occupying the position of the three angles of an isosceles triangle, two of which are in the stationary part or body of the tool, the other being an adjustable cutter. This latter is advanced or receded by a screw working in a line passing midway between the stationary axial cutters, so that the pipe to be cut is held equally between the three cutters in whatever position the movable cutter may be adjusted. When thus arranged, the cutters are said to perform their work in an equal degree.

In the formation of this tool the space which the two stationary revolving cutters occupy is cut out by a saw.

Howarth states that this tool may be used to advantage in cutting a pipe while on a wall or ceiling, wherever it can be vibrated as much as a third of a circle. Another advantage claimed for it is that it will cut three times as fast as a tool having but a single cutter.

Theodore S. Foster, of Fitchburg, Mass., in 1867 constructed a pipe cutter in which a cutting knife is made to vibrate between the two sides, which form the bend or claw. The pivotal point of this cutter is placed below a line drawn from the cutting edge to the point of the feeding screw. The cutting edge and back are curved, so as to adapt it to different sized pipes. The mode of hanging the knife makes it easily detachable for the purpose of grinding or renewing.

The two friction rollers are made with an annular groove to receive the burr caused by the cut. It will be seen that the feeding screw is made to act directly upon the strongest part of the knife, which arrangement also relieves the strain on the knife's pivotal point.

The invention of Henry Getty, of Brooklyn, the patent for which expired last August, consists in the arrangement of two transverse rollers, in combination with a V-shaped cutter.

This tool makes a draw cut on the tube in either direction, while the instrument is held steadily. The burr formed upon the pipe by the cutter is intended to be smoothed down by the rollers during the operation of cutting.

The V-shaped cutter is adapted to be received by the "claw" or outer end of the tool, and projects inwardly beyond the surface of the claw. The slide, in which the adjusting screw is swiveled, has a large slot, in which the outer end of the cutter slides in shallow grooves. The guide rollers are carried by this slide, and the V-shaped cutter by the hooked end; and they are advanced to or receded from each other by means of the usual screw and its projecting stem, to which the handle is attached.

The arrangement of the two rollers not only supports the tool against the pressure of the cutter, but also serves to steady the implement, and prevent any tendency of the tool to twist out of line when in use. The rollers also effectually smooth the burred end of the pipe, thus greatly facilitating the operation of the dies in cutting a screw thread upon the cut ends of the pipe.

The handle, it will be seen, is made hollow, and is formed of two concave sections of cast metal, the outer end of the screw shank being passed through them, and secured by a suitable nut on the end of the shank.

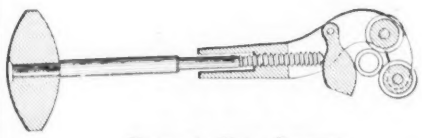
The other pipe cutter shown is the invention of a Mr. C. C. Parsons, of Boston. The patent expired last Fall.

Parsons constructed his tool with two rotary disk cutters working in conjunction. Each of these cutters has an angular cutting edge, the inclination of the two being opposite, and the cutting edge upon the outer face of each.

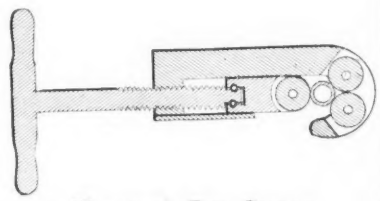
The cutter stock is designed to be applied to a slide rest in a lathe. When so used, it is pressed up toward the pipe or bolt, which rotates in the lathe, bringing the cutters into contact with the pipe, care being taken that it is brought equally or centrally against both cutters. The cutting edges of the two cutters will then operate on the surface of the pipe at a distance apart equal to the distance between the planes of the cutting edges. The metal between the cutting edges is cut out as the cutters are fed into the pipe.

It will be observed that the action of this tool does not merely displace the metal by throwing it upon the surface as burrs, but that it cuts away the metal entirely, any burrs thrown up being carried with the cut-away portion, leaving the ends of the pipe smooth and of their normal diameter.

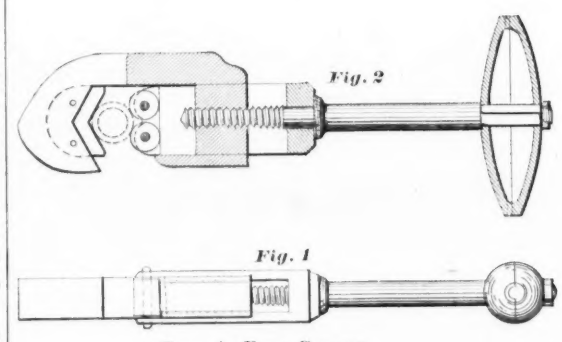
The cutting edge of each disk is preferably on an angle of about forty-five degrees, although the inventor states that the angle may be somewhat varied.



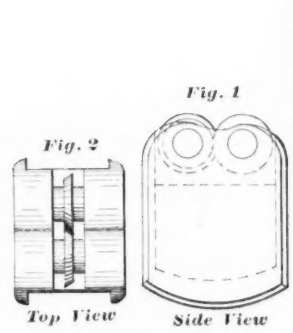
FOSTER'S PIPE CUTTER.



HOWARTH'S PIPE CUTTER.




GETTY'S PIPE CUTTER.




PARSONS' PIPE CUTTER.

Englishmen as a nation and individually are weak on foreign topography, but we were hardly prepared for a blunder respecting New York, recently made by the *Electrician*. That exponent of electrical science recently intimated to its readers that the gigantic statue of "Liberty Enlightening the World," forming the lighthouse at the Hell Gate entrance to New York harbor, has been lighted by electricity. We commend this article of news to such journals as the *Saturday Review*, which we remember made ponderous fun of a French writer who made a character in a story rush naked and bare-footed out of Buckingham Palace and escape over the river at the Thames Tunnel, the nearest means of crossing.

## Scraps—No. 3.

BY J. G. TRAMIS.

When the time comes for the introduction of industrial schools, or the embodying of working departments in our public schools, the changes necessary to be made from the present methods will not be as great as may be supposed. We now have scholars, teachers, buildings, books, and apparatus, and what more is wanted but tools and material? To balance these there will be less books and less apparatus. The greatest and most difficult of all the changes will be in the teachers. As our technical institutes have found more difficulty in finding the proper men to give practical instruction than to fill any other place in the institutions, so it will be difficult to find the right men to conduct the different branches of industrial instruction, and after they are found it will be difficult to keep them, for the reason that school trustees will be very reluctant to admit that the man who teaches handicraft, however valuable the knowledge may be, is worth as much money as the man who teaches grammar or Greek, however valueless the results.

The success of the Massachusetts Institute of Technology is often held up as a shining example of what can be done by the introduction and proper carrying out of a thorough system of instruction, but I believe the success of that school (and the results are perfectly marvelous) is in a far greater extent due to the men employed than to the system. That institute, or any other, may search the United States over without finding another man equal to the one who has charge of their smith shop, while the positions of instructors in the intellectual branches could be replaced by a drove of graduates from other institutions. In this connection it would be interesting to know the wages paid to this man, and the salary paid to the instructor in algebra.

Other institutions have copied their forges, copied their models, and copied their system, probably; but we do not hear that they have copied their results. Buildings may be built, models supplied, tools set up; and without the man of genius to direct, the result will be disappointing. The man of genius at the helm will, with but little except students, make a success. With a simple forge, and the *debris* of a fire or the wreck of a bridge for materials, he will find a way to give instruction in forging; with a hammer, cold chisel, and a brick, he can teach the rudiments of stone-cutting; and with an axe, a saw, and the limb of a tree, the first lesson in carpentry.

One thing is likely to trouble the industrial school, as it does to a lamentable degree the technical institute: that is, too much stress is laid on the importance of what is being taught; so the student gets the idea that, having learned so many valuable things, he must of necessity be a valuable man, and so over-estimate his own worth—a universal mistake with nearly all graduates. Marvelous as is the work of the students in the Massachusetts Institute of Technology, it is doubtful if either one of them would be of any more use as chief of a blacksmith shop, than a graduate of a commercial college would be as cashier of a bank.

Class instruction in industrial training has the same single advantage as class instruction in intellectual training, economy; and all the disadvantages, and some with worse results.

All children are not alike; all are not wanted to follow the same walks in life; and there is no place in human affairs where there is any gain in trying to make them fit the same gauge. When too much is done in this direction, a large proportion become so disappointed and disgusted that they simply comply with the requirements, and lay the thing aside for ever after. I have known a teacher in free-hand drawing train class after class so as to get good work out of nearly every student, and none, except those who had adopted art before, ever followed the practice of free-hand drawing after.

Whatever the system, the work should be made fascinating. In combining the intellectual with the industrial training, the former should be that which grows out of the latter, or is called out by it. No better way possible can be devised to teach writing and spelling—that is, the use of language—than by requiring the student to write a description of the thing he has himself made; for, if there is any one thing he knows more about than another, it is likely to be this, and a judicious system of correcting the errors, so as to encourage rather than humiliate the pupil, is a most effective mode of instruction. When the student knows about the thing, or is in possession of a fact, the language to describe or express it is easily acquired.

That mechanical and free-hand drawing should be taught in all industrial schools—in fact, in all public schools—is true; but that drawing should be taught all scholars is not true, for to those who are never to use it in after life it is as much waste of time as the study of music is to those who have neither the taste nor inclination for it.

The time the poor man's children have to obtain their training in is far too short to be fooled away on the ornamental, and the lessons should not only be those which drive direct towards the objective point, but two or three lessons should be crowded into one. Let every lesson in drawing be so devised that it teach the art of drawing, give an idea of the tool or machine, and be a lesson in geometry at the same time.

While the boy is chipping his brick, he may learn to handle the hammer and chisel, and learn to make something, and a thorough teacher can at the same time give him all the facts he may ever wish to know about burnt clay, from bricks to porcelain china.

The Detroit, Grand Haven and Milwaukee Railroad Company are determined that no more accidents shall happen on their road through variation of watches. Time will be taken all over the road every day at 10 A.M., and all time-pieces regulated. Then all conductors and engineers must compare their watches with each other and with the clocks at division headquarters before starting on their trips, and, when practicable, are required to compare with conductors and engineers of other trains they meet, and also with clocks at local stations, reporting to their superintendents all discrepancies. The value of the rule allowing five minutes for the variation of watches will be seriously impaired if conductors and engineers fail in being specially vigilant in this respect. Roadmasters, section foremen, and signalmen must ask station agents or conductors for correct time daily. No excuse whatever will be accepted from any employe having to do with the running of trains or the care of the track for failing to live by the requirements of the circular.

## Richmond Mechanics' Institute.

Manufacturing industries are rapidly developing in several Southern States, and the citizens in some of the growing towns are displaying a zealous desire to provide technical education for their workmen that Northern people might advantageously imitate. We have several times given particulars concerning the working of a night school, established in Richmond, Va., for the purpose of providing workmen with instruction in the scientific principles relating to the mechanic arts. This school owes its existence to the energy and liberality of the citizens. Since the institution is now in good working order, and the demand for admittance continues to exceed the accommodation, the friends of technical education for workmen are striving to obtain State support for the school. This is right and proper. State authorites are very slow to do anything to advance education out of the stereotyped lines, and they cannot too soon be made to recognize the night school as an institution entitled to public support. State legislators often take great credit to themselves for granting liberal support to universities, medical schools, law schools, and similar institutions, but we have not yet seen any desire among them to provide the means of a scientific instruction to the industrial masses.

The Legislature of Virginia is requested to appropriate $20,000 to the night school, which will be called the Mechanics' Insti-

tute of Richmond, on condition that the city appropriate $10,000, and private individuals or corporations $5,000 more. The movement is most commendable, and we trust that it will be crowned with success. Not Richmond or Virginia alone is interested in the result of this movement. Every district in the United States where mechanics are hungering for the instruction that their States neglect to furnish, may have their needs supplied more readily should the Virginia Legislature inaugurate the movement in support of evening schools for mechanics.

### Improved Micrometer Caliper.

Some time since the Brown & Sharpe Manufacturing Company, Providence, R. I., purchased the patents of the "Victor" micrometer caliper, and incorporating the recognized good features of that instrument with ideas of their own, have produced the tool shown in the engravings, which are front and back views, full size.

The construction of the improved caliper is very similar to that of the "Victor," the strength, which enables different users to measure alike at different times, being preserved. The nut, however, instead of being in the inner end of projecting arm, with thread cut away from outer end of arm, is made the reverse, the thread occupying the outer end only, while the inner end is cut away, thus permitting the cutting away of the threads of screw from projecting part *C*. By moving sleeve *D* back to end of arm, the nut can easily be reached for re-adjustment for wear at any time. The thread being covered at all times, there is no liability of its injury from any cause, and as the hole at front end of arm is the size of blank portion of screw, it is thus kept perfectly clean.

This design, in connection with the adjustable nut in outer end of arm, dispenses with all projections for clamping screws, which not only adds greatly to the appearance of the tool, but enables it to be used where a projection would interfere.

The adjustable nut used in this caliper is, after adjustment, practically a solid one, pressure being direct on screw thread, having no tendency to spring the nut apart.

Another desirable feature of this caliper is in having the decimal equivalents of $\frac{1}{64}$, $\frac{1}{32}$, $\frac{1}{16}$, etc., stamped on the frame. Heretofore it has been necessary to have a printed list to refer to when these fractions were used, which was particularly annoying when in a hurry and the list had become mutilated or mislaid. Here the figures are always with the instrument, thus making it complete in itself.

A brief description of the principles of construction and operation of this tool may be of interest to those not accustomed to its use: The micrometer screw *C*, being cut accurately 40 threads per inch, one revolution of screw by means of sleeve *D* necessarily moves it $\frac{1}{40}$ inch, which equals twenty-five thousandths (.025) of an inch, and $\frac{1}{25}$ revolutions of sleeve *D* ($\frac{1}{25}$th of $\frac{1}{40}$th) or one thousandth of an inch. Arm *a* of U frame has a line on front side, drawn parallel with axis of screw, there also being short lines drawn at right angles to it. By a line on sleeve *D*, marked 0, it allows of an exact revolution. Thus we have $\frac{1}{1000}$ inch for every graduation on sleeve *D*, also $\frac{25}{1000}$ for each graduation on arm *A*. On the lower engraving the reading is .080 inch. Every fourth graduation on arm *A* is marked 1, 2, 3, etc., which represents $\frac{1}{10}$, $\frac{2}{10}$, $\frac{3}{10}$, and so on.

The American Society of Mechanical Engineers, which is four years old and has nearly 600 members, wants a library at the Society's headquarters, 15 Cortlandt Street, New York. The revenues ($10 a year for each member), are not sufficient to set apart any essential portion for the purchase of books, therefore contributions are solicited from members, either in sums of $10 and upwards, in annual subscriptions of $2 each, or in direct contributions of books and papers. The object is a good one. A select engineering library ought to be established for the benefit of the members, and it doubtless will be established. Special subscriptions to the fund would probably be more acceptable, and the more promptly they are made the greater will be the success of the enterprise.

### My First Blizzard.

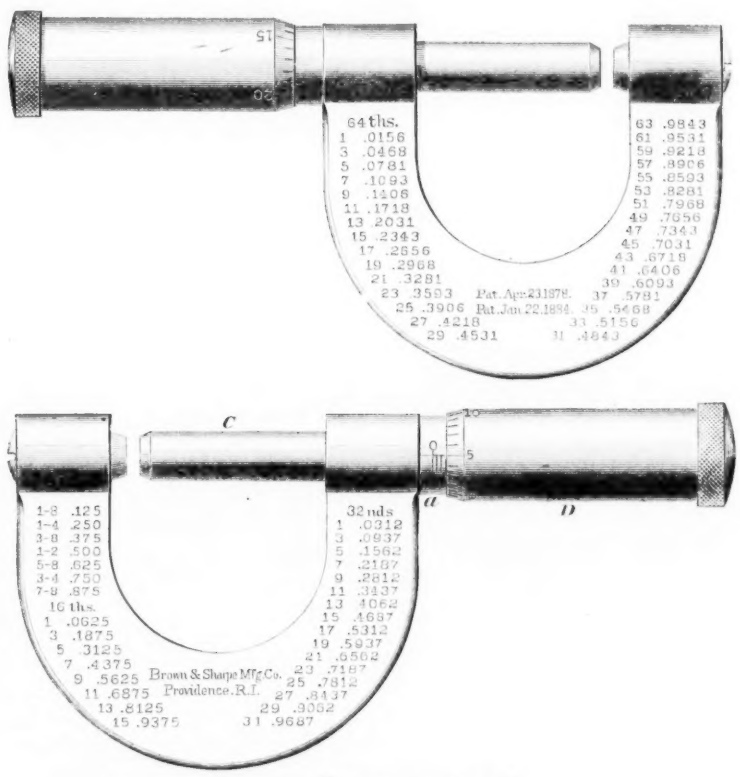
BY SAM RARUS.

When my uncle ceased to be receiver of the Grand Slough and Mississippi River Railroad in Southern Missouri, where I had advanced in two years from the position of a grocery clerk to that of locomotive engineer, I found the new officers of the road did not appreciate my merits, so I took my traveling papers and moved round. After trying in succession railroading in Texas, New Mexico, California and Colorado, without finding matters just to my taste, I struck a job in the fall of '79 on the Nebraska Northern.

I cannot say that this job entirely fulfilled my expectations of striking a soft snap for the winter, but it was a ground hog case, for I had got dead broke during the extensive inspection I had made of the railroad world. The road was rushing business, and was short of engineers when I was hired. The master mechanic gave me a note to the round-house foreman, saying he might send me out. I supposed this meant that I would be sent round for a week to learn the road, but the foreman handed me a time-card and mileage-book, and said they would soon learn me the road. At ten o'clock that night I was called to take a train of twenty loaded stock cars over the southeastern division. To start out with a heavy train at night, with a strange engine on a single-track road, is a trying position, but the difficulties of the case are increased a hundred-fold when the journey has to be made over a strange road, whose train rules and orders an engineer happens to be entirely unacquainted with. However, I determined to do my best, so I looked the engine over carefully—it was a Baldwin in fair order—oiled every cup, bearing and box, and while waiting for the order to start studied over the meeting points. After getting the train going, I kept plenty of water in the boiler, and held the train running at as nearly uniform speed as the case would admit of. The road was undulating. When I got running down a hill where steam was not needed, I watched for the creek bridge that generally indicated the bottom of the grade, and was the signal to give her the steam. By the help of the fireman and head brakeman I found the water tanks, and the trip was made without any mishap.

I had been running on this road about two months, when on getting out of bed one morning I found a heavy coating of snow on the ground. Snow had been falling the greater part of the night. There had been no snow of any consequence where my previous railroading had been done, and I felt very much like laying off now, for the boys often spoke about the rough times they had snow-bucking. However, on reflection, I concluded to go out, for I guessed I could do what any other man had done.

I was down to go out in the forenoon with a freight train over a northwestern division that had a bad character for snow. When I went to my engine the fireman advised me to get a heavy overcoat and Arctic overshoes. These articles seemed to me superfluous in the comfortable cab of a locomotive, so I started without them. Although considerable snow had fallen, the weather was mild and pleasant when we started out, and there was no difficulty in taking a full train along, for frequent trains had kept the track clear. The division I was bound over followed the main line for twenty miles, then struck to the northwest through a country that was thinly settled. We had met with several delays on the main line, and it was about mid-afternoon when we reached the junction. We were glad to get away from the main line, for we knew that on the branch we would be free from the delays incident to meeting numerous trains on a single track. About the time we got rightly going on the branch, the wind began gradually to rise and the temperature began to fall—not slowly by any means, but surely enough. At first the light breath of wind seemed to toy with the soft, feathery particles on the surface of the snow. The downy flakes clinging to exposed tufts of prairie grass and, reposing on the leaves of scrub oak, would rise on the breeze and be wafted quietly to more sheltered resting places. As the speed of the wind increased, the clumps of light timber passed began to look like fallen dust clouds; then the surface of the prairie snow got in motion. There was nothing tumultuous or fear-inspiring about it. It merely looked as if the whole surface of the earth was a stream of snow dust flowing southward.




IMPROVED MICROMETER CALIPER.

There was still no obstruction of a serious nature on the track, but at the first water station, where there was some delay with a meeting train, I found that the cold had frozen the axle-boxes of my train so badly that I had difficulty in getting away with half of the train. The knowing ones round said a blizzard was coming, and that the sooner we got to the end of the division the better. The train dispatcher gave us orders to push through with whatever train we could safely take. By the time darkness began to close down upon us we had got within thirty miles of the terminus, and were pushing on for all the engine was worth. But the character of the storm had changed. The wind had continued to rise, and the river of snow dust gradually ascended till its surface was away beyond sight, and the whole world seemed to be a cloud of driving snow. Above, below, in every direction nothing was to be seen but blinding snow dust.

I had nothing to clear off the snowdrifts with except a slatted pilot and brushes in front of the engine truck. The snow was now becoming troublesome, and the drifts in the cuttings were getting ominously near the rails. As I pushed my head out of the window to get a glimpse ahead while passing through a cutting, the snowbank had crept so close that it rubbed off my hat, and would have taken off my head, too, had the snow been hard enough. It was all I could do to get the train through that cutting, and I stuck outright two miles further on. The place where I stalled was about an eighth of a mile up an ascent, that succeeded a down grade over a mile long. It was a frightfully bad place to lay up, for a train was supposed to be following us and it was impossible for a flagman to remain out, and it was equally difficult for a man to walk back to the next station through such a storm as was raging. Fortunately, I was able to back out of the snowbank, and by making a tremendous run down the grade forced my way through the snow that had stalled the engine running at a lower velocity. By the time I got through this obstruction, another cause of disquietude began to haunt me. The toilsome journey from the last water tank had drawn heavily on the water in my tender, and it was getting low. Stoppage in another drifted cutting would make us face the necessity of dumping the fire. This emergency did not overtake us, but we were subjected to tribulations equally severe.

A few miles ahead was a water station and here we had resolved to ask for orders to remain till morning. Visions of lying comfortably in the side track, with the warm way-car as a shelter, began to be very attractive, for I was beginning to suffer horribly with the cold. The piercing wind was blowing on my side, and it whistled in through crevices at the sides of the cab and running board, and eddied through the back boards in chilling gusts. My thin shoes were no protection to my suffering feet, and my thin, nice-fitting overcoat that I had so often worn with pride seemed now to mock my suffering, and permit my life's blood to freeze in my veins.

When we got to the water station, we found the supply spout of the water tank frozen solid, and not a drop of water would run out. We toiled for long with bars and hot pokers to make an opening through the ice; we burned all the waste and kerosene we could find, impinging the flame on the pipe, but it was labor lost. Meanwhile our tender was empty. Seeing that water could not be obtained, the proposal was made to replenish the tender water with melted snow. Melted snow can be used to fill a tender, but not the light, unpacked snow that we had to deal with on this night. We tried it, however, but merely succeeded in adding to our discomfort and fatigue. Next operation was to dump the fire of the engine, and to make provision against any pipe, tube or valve getting destroyed by water freezing within it. As the steam began to go down, I opened the cylinder cocks and blew steam through the cylinders. The feed-pipes belonging to the pump and injector were kept warm as long as any steam remained in the boiler. When the gauge index got back to zero, I opened the blow-off cock and permitted the water to run out of the boiler. All this work was not done without considerable suffering, but a harder job remained to be done. The feed-pipes had to be uncoupled and the pump joints loosened. While the fireman attended to the couplings, I crept under the engine with wrenches to loosen up the nuts that bound the pump chamber joints. The wrenches would not fit the nuts, so I had to get hammer and chisel to wrestle over the job with. Then was the time I properly appreciated what a blizzard meant, as the searching wind penetrated my vitals. I remembered trying to steady the lantern on the feed-pipe,

so that I could see the nut I was trying to loosen, and it seemed that the nut and the lantern got mixed up in some curious way, and got chasing each other round the driving wheel. I got amused with the fun, and sat watching it, oblivious to the howling wind and my frozen couch. Next that I remembered I was lying on a cushion in the way-car, and the train men rubbing my limbs with flags.

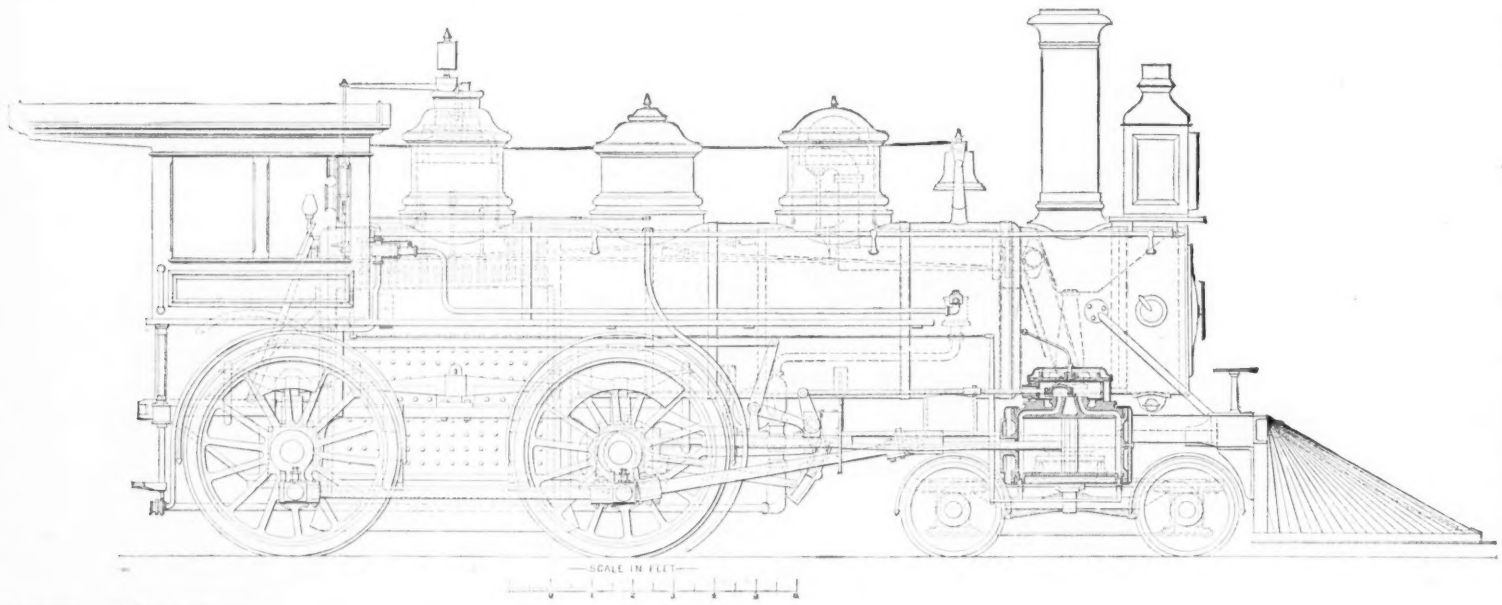
It appeared that I had gone to sleep under the engine, and my fireman, thinking I was long over the job, came and found me frozen nearly stiff. Three months in bed with rheumatic fever was to me the sequel of that night's experience.

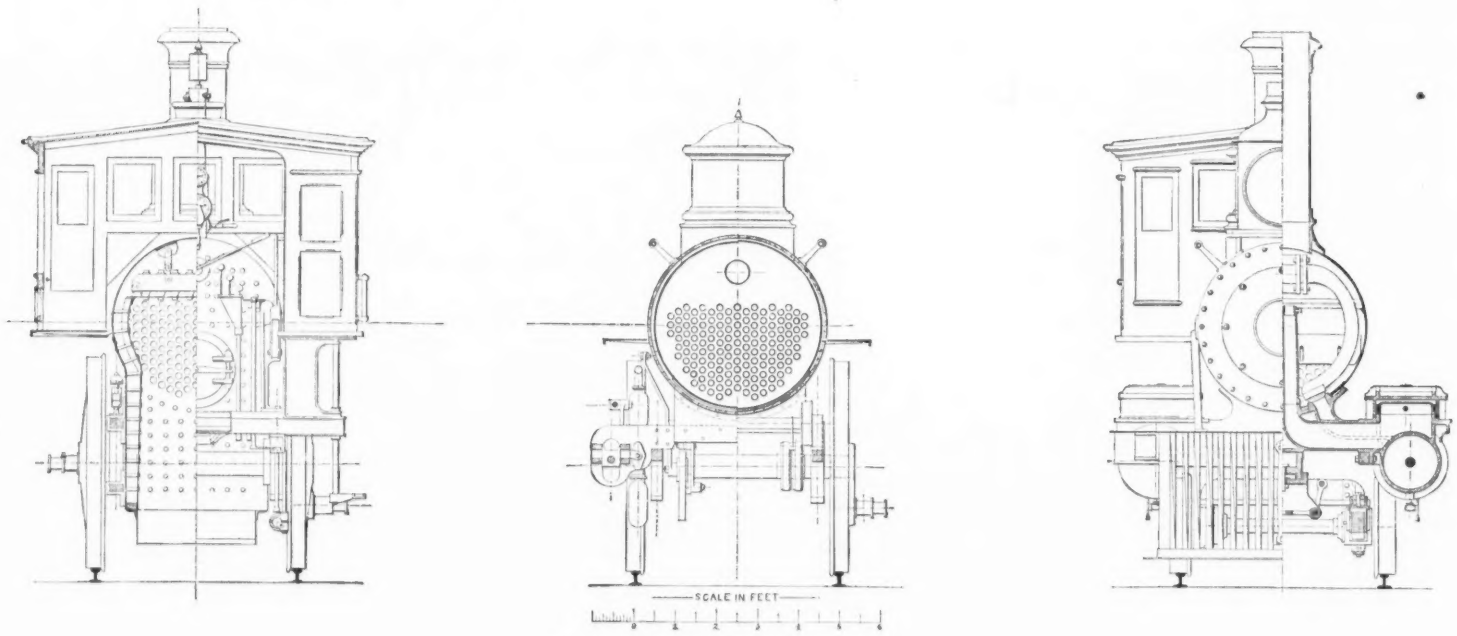
The December number of the *Electrician and Electrical Engineer* cribs entire, except the headings, an editorial article which appeared in the September 20th issue of the AMERICAN MACHINIST, entitled "A Bogus Electric Light Company." The article related the method employed by a New York electrical expert to prick an electric lighting bubble, and save the money of a client who had been solicited to invest in the scheme. Our electrical contemporary substitutes for ours the heading, "Saved his Money," to which variation we should probably make no objection were the article itself not credited to another journal, which is said to "vouch for" the truth of the story. As we omitted to state the name of the expert in question, neither the voucher nor the vouchee, however, seems able to tell who he is. Next time we shall endeavor to be more considerate.

The British exports of steam engines and machinery to the United States for November, 1884, amounted to £31,487 against £35,127 for November, 1883, according to the Board of Trade returns. The pig iron exports to this country fell from 23,653 tons to 10,374 tons by the same comparison. The whole exports of steam engines and machinery for November, 1884, to all countries amounted to £932,860, as against £1,163,920 in November, 1883.

## Baldwin Eight-Wheel Locomotive.

On this page we present four views of an eight-wheel locomotive, built by the Baldwin Locomotive Works, Philadelphia, for Morgan's Louisiana and Texas Railroad and Steamship Company, and intended for exhibition at New Orleans World's Fair. The engine is a standard type of the builders, which has given remarkably good results on numerous roads. The boiler is straight, with two steam domes, the dry pipe being placed in the forward one and the safety valves on that above the fire-box. The inside diameter of the smallest boiler ring is 47¼ inches, and the boiler has 144 flues 2 inches diameter and 10 feet 10⅜ inches long. The fire-box is 64 15/16 inches long by 34⅜ inches wide and 61¾ inches deep. The heating surface of fire-box is 100 square feet, and that of the flues 717 square feet, giving a total of 817 square feet. The boiler is made of the best Pennsylvania cold-blast charcoal iron ⅜ inch thick, and the fire-box is of Ohio steel, the sides being 5/16, the crown ⅜, and the flue sheets ½ inch thick. The smoke-box is of the extended type, with netting diaphragm plate and spark ejector. To feed the boiler, two pumps and one Sellers' injector are provided. Although not a heavy engine, the weight is well distributed, 44 000 pounds resting on the drivers and 27,000 pounds on engine truck. The cylinders are 16x24 inches, and transmit power to driving wheels 62 inches diameter. With a mean effective pressure of 100 pounds of steam this would give a tractive power of 9,909 pounds on rail.




BALDWIN EIGHT-WHEEL LOCOMOTIVE.

Letters from Mr. A. C. Hutchinson, president, and Mr. Julius Kruttschnitt, superintendent of Morgan's Louisiana and Texas Railroad, give interesting particulars about the performance of one of these engines. On August 6 last, locomotive No. 23, Chas. Devoe, engineer, took a train of 105 cars, weighing 1,816 gross tons of 2,240 pounds, from Mile Switch to Algiers, a distance of 19 miles, over a practically level track. The management assumes that the frictional resistance of the train was 7 pounds per ton, and that the engine developed a tractive power of 12,712 pounds, which would represent a little over 127 pounds effective pressure. The boiler pressure carried was 130 pounds per square inch.

Louisville, Kentucky, will make an application to Congress for the loan of one million dollars for the International Agricultural Exposition in that city next fall.

## Where is the Snow-Melting Machine?

During the warm months of summer a New York mechanic wrestled over the invention of a snow-melting machine that was to accomplish wonders in the way of turning snow rapidly into water, so that the obstructions that make city streets partly impassable after heavy snow falls should disappear through the sewers. Several trials of the machine were made with ground ice as a substitute for snow, and several of the daily papers commended the scheme and repeated the inventor's assertion that the machine which was merely a small portable boiler with about 400 square feet of heating surface would melt sixty car loads of snow a day. Of course a stock company was to be formed to control the patent and build the machine. There is now no longer any use for using crushed ice to test the melting capabilities of a machine of that kind, for the streets are knee-deep in snow, ice and slush, but where is the snow-melting machine? As we anticipated at the time it was first tried, the machine is useless for real snow melting. It is no doubt comfortably housed in some protected shed where it will wait for some finishing touches till the warm weather returns, when it will be ready for operation again for the same purpose it was first brought out for.

## Steam Engines at the New Orleans World's Fair.

In the center of the machinery department, and entirely bisecting it, is a space one hundred feet wide and three hundred feet long devoted to the steam engines, while the immense battery of sixty-six boilers is accommodated outside of the main building in a structure specially built for them in the immediate rear of the machinery department, but separated from it by an alley or street. This enormous range of boilers presents a front of four hundred feet, and they are all connected together by a great steam drum, which traverses the battery its entire length. The steam being gathered in this drum is supplied to the engines through a riveted main pipe twenty-six inches in diameter. This main has out-valves at various points connected with small pipes, which feed steam to the several engines. Another, but smaller, pipe leads from this main to the right and left—that to the left carrying steam to the cold storage engine and pumping machinery, while the pipe to the right, after traversing the southern half of main building, crosses Magazine Street, and gives steam to the machinery in the iron cotton mill building and the saw-mill annex. There is fully half a mile of this steam pipe, and it is supported on roller brackets so that it may have full play to move forward or to retract when expanded by the heat of the steam or contracted by its absence. So considerable is this change of length in the pipe, by reason of the varying influences of heat and cold, that if the pipes were not free to move longitudinally, and the joints by which it is connected with the several engine pipes were not arranged to accommodate this movement, the pipe would burst its connections and be torn from its fastenings. Science, however, has stepped in to guard against such a mishap.

The boilers have a steaming capacity equal to about six thousand horse-power, which is supplied to twenty engines of various sizes. All of the engines yet erected—and some of them are very large—have a horizontal action, and it is strange that no engine with a perpendicular motion has been placed on exhibition, considering the fact that most steamship engines have a perpendicular action, and in this seaport steamship engines would attract attention. Of the various engines on exhibition there is much to be said in the way of praise. They work with exceeding smoothness and regularity, and each has some special feature of mechanical detail, which is of interest to the practical mechanic. —*New Orleans Picayune.*

A new water reservoir recently built by the Lackawanna Iron & Coal Company, at Scranton Pa., gave way two days after finished, deluging a great part of the town, damaging a great deal of property, and seriously endangering the lives of several persons who were caught by the flood. The cause of the wall giving way was reported to be a mystery, but it may safely be attributed to structural weakness, or inferior work.

## LETTERS FROM PRACTICAL MEN.

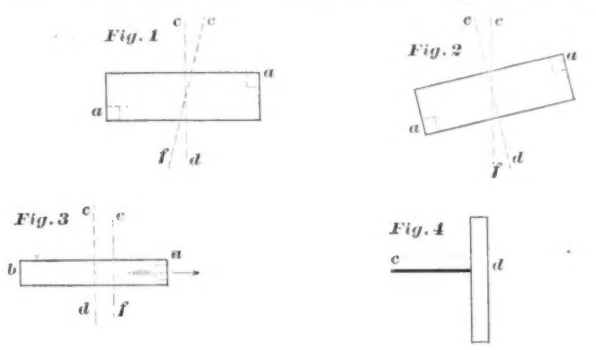
### Balancing Revolving Bodies.

*Editor American Machinist:*

Recently my attention was called to a pamphlet published by the Defiance Machine Company, of Defiance, Ohio, explaining their system of balancing pulleys and other revolving bodies, a system which is unquestionably correct both in theory and practice. In it is developed the fact that a body which is free to rotate about any axis through its center of gravity, will be in equilibrium when rotating about a free axis, that is about an axis of symmetry of mass. For example, the axis of symmetry of figure of a pulley, shown by Fig. 1, is *c d*, and if properly balanced, that is also the axis of symmetry of mass. If on the other hand, the pulley is not properly balanced, say that there are equal masses arranged as at *a* and *a*, then the axis of symmetry of mass is not *c d*, but some line as *e f*, inclined toward *a* and *a;* and when revolving freely the pulley will take the position shown by Fig. 2.

Applying the consequences of this case to one which is entirely different, the pamphlet states that a pulley which is out of balance, as it would be with a single added mass at *a*, Fig 3, will when rotating about the axis *c d*, pound toward the light side *b*. This is a case of constrained rotation accompanied by a centrifugal force as indicated by the arrow, of which the amount may be calculated by assuming that the mass of the whole revolving body is concentrated at the center of gravity on the line *e f*. This constant centrifugal force produces a pressure of the axis *c d* against the bearings on the side *a* or the heavy side, and if the bearings can move or yield slightly in a given direction, there will be a shock when the force coincides with that direction.

The Defiance Company can easily test this question if they will fix a disk, out of center, to a stout wire of iron, as shown by




BALANCING REVOLVING BODIES.

Fig. 4, put the end *c* into the chuck of a speed lathe, and set it to revolving at a fair speed, and then note how the wire is bent.

A variation of the experiment is to pass the wire through the disk and set it to revolving in bearings at the ends.

C. H. PEABODY,
Assistant Professor of Applied Mechanics, Massachusetts Institute of Technology.

### A North Carolina Engineer.

*Editor American Machinist:*

I was called on some days ago to go out in the country to see what could be done with a boiler which furnishes steam for an engine used for ginning cotton. When I got there I found that the sheets of the fire-box (at the back) had bulged so as to pull three staybolts out of the outside sheet. Upon examination I found about 100 pounds of weight, in addition to what was intended, hung on the lever of safety valve. I then asked for the engineer, and asked him why he had all that weight hung on the safety valve. "Boss," said he, "that thing loses so much steam when the hand gets round here" (pointing to 160 pounds on the steam gauge) "that I can't stay under the shelter; but that weight fixed it all right."

I replied that it was a wonder that it had not *fixed him* as it had done for the boiler. "Why, Boss," said he, "that didn't do it, but I'll tell you what did do it. You see, I had a purty good head o' steam when the belt broke, and I thought while they was fixin' it that I would go down to the fence there by the woods and get a fat rail to fire with; so, when I came back, I chucked up the fire a little, and by that time they had got the belt fixed, and when I blowed the whissel to start the engine, hit busted right away. I allers was 'feard of a whissel, anyway."

But how about your steam? How much did you have when you blew the whistle? "Well, Boss, I don't know adzactly. When I went arter the rail that hand was right there" (180 pounds, all that was marked on the dial); "but when I come back hit was agin the pin whare it starts from."

About this time the owner came up and said that he stood at the door for ten minutes before the man got back with the rail, and the index hand was at the pin when he got there: but as that was no unusual thing he did not think much about it; "but *that whistle has to come off.*"

When asked why he employed such a man to run an engine, he said: "Why, he knows all about it; he has worked in a *blacksmith shop for two years.*" TAR HEEL.

### Inside Lap of Slide Valve—An Improvised Section Liner.

*Editor American Machinist:*

I notice in your issue of December 27 a communication from Frank Hill on exhaust lap. You do not seem to agree with him, that removing the exhaust lap had much to do with the coal pile. I ran a 7″x10″ traction engine, with valve of the same dimensions that his had. It was a new engine, and valve and piston all tight; but it used to "blow" sometimes, but in this way: In that country (North Dakota) they work an engine for all it is worth, and a little more, sometimes; and when on the road, churning along with some 15,000 pounds load (including engine) to draw, and making some 500 revolutions per minute, she would occasionally work water so badly that it was necessary to close the throttle. Then she would blow for several seconds after the engine had stopped moving. The blow was caused by the very small exhaust nozzle causing a high back pressure in the heater and exhaust pipe, and when she worked water the heater got partly full, which choked the nozzle, so it took some time for the pressure to get out of the heater after the engine stopped. In regard to the $\frac{3}{32}$ inside lap, I think in this case the engine would do full as well without it. In the first place, the exhaust nozzle is so small that it makes the back pressure in the heater and exhaust pipe so great that, when working hard, one can hardly distinguish the exhausts, one from the other. It is a continuous roar, a little more intense at the end of each stroke. Judging from the sound, the back pressure could not have been less than 10 to 15 pounds, and running at 230 to 250 revolutions when threshing and 300 to 500 on the road, I do not think that the valve would get rid of the exhaust steam any too fast if the inside lap was removed. As for cushioning, I think with 10 to 15 pounds back pressure to start on when the exhaust closes, and then compressing that 10 to 15 pounds up till the lead opens the port for admission, will give all the cushion required without inside lap. With engines without much back pressure I think some inside lap is needed, but in cases like this I think plenty of lead with little or no inside lap is best.

I have a little kink of my own in the line of drafting instruments that may benefit the trade. I have been in need of a section liner for some time, and not feeling able to pay the prices charged, I hit upon a very simple plan: Take a $\frac{1}{4}$″ rod, 6″ or 8″ long, or as long as you like. Put it in the bolt machine and thread it the whole length. Put on two square nuts far enough apart to let your triangle go between them, and leave as much play between the triangle and nuts as the distance apart you want your lines. All you have to do is, place the triangle against the T-square, place the rod above it with the nuts resting on the paper each side of triangle and against the square; lay the left hand on the square to hold it, the middle finger on triangle and thumb on the rod; hold the triangle and draw a line, then push rod along till nut strikes triangle. Hold it there and push triangle along till it strikes the other nut, and draw another line, etc. If the triangle is too thick to slide under the rod, make it thinner or get bigger nuts.

REVERSE GEAR.

### Destructive Hydraulic Pressure Tests.

*Editor American Machinist:*

In a recent number of the AMERICAN MACHINIST is a very interesting article, by R. E. Masters, on the steam boiler that recently exploded at Eufaula, Ala.

In describing the new boilers that are to be used at this place, Mr. Masters says they are to be "tested to 230 lbs. hydraulic pressure." If these figures are correct, this would put a strain of over 26,000 lbs. per square inch of section (which is probably in excess of the limit of elasticity of the metal) on these boilers before they are steamed up.

It would be interesting to know all the particulars as to what the limit of elasticity, etc., of the steel of which the exploded boiler as well as the proposed new boilers is, but it is safe to say that if the exploded boiler was subjected to this rough treatment it is no wonder it "let go and killed some one."

Again it would be interesting to know who is responsible for this enormous pressure being put on these boilers, as well as the object expected to be gained by it.

It is a very common matter for purchasers of steam boilers to insist upon a destructive hydraulic pressure being put on a boiler, in order to be assured it is safe to be worked with a moderate steam pressure; and this is one of the things that often makes the life of a boiler maker a very unhappy one. The boiler maker knows he is doing his customer an injustice in subjecting the boiler to a needless and useless strain, but it is so much easier to comply with the demands than it is to argue the case, that the result is that a great many of what would otherwise be good boilers are started on their work of destruction before they leave the shop in which they are built.

Can any of your numerous readers give us a remedy for this abuse?

W. H. ODELL.

### Locomotive Valve Gear.

*Editor American Machinist:*

In your issue of December 27, Mr. Buckeye gives us something under the head of "Slide Valve Anomaly." I fail to see how he gets more port opening with $\frac{7}{8}$″ outside lap than with $\frac{5}{8}$″, the throw being the same, as the backing eccentric has very little influence when in full forward gear, and that is to diminish the throw as it is drawn to the center of the link. This applies to the American standard locomotive link. E. C. J.

Newark, N. J.

[Our correspondent overlooks the important fact that Buckeye mentions the increased port opening is got when the links are hooked up. It does not apply in full gear.]

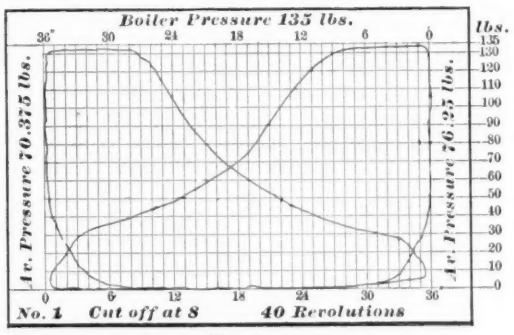
### Indicator Diagrams from the Largest Locomotive in the World.

The accompanying indicator diagrams are reduced to half size from blue prints of cards taken from the locomotive El Gobernador, sent us by Mr. A. J. Stevens, General Master Mechanic of the Central Pacific Railroad. Mr. Stevens writes us about the engine:

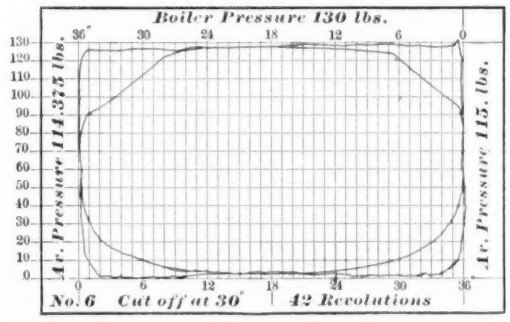
"We now have her at work on the Tehachipi mountain, and she is performing splendidly, contrary to the predictions of a great many "wise men" (they were not from the East, however, as in earlier times we read about), she is tracking superbly. The piece of road over which she is now running is a succession of 10 deg. curves for 25 miles, and an incline of 116 feet to the mile. Her load is 19 loaded freight cars.

"The cards were taken when the engine was working on a 116 foot grade, the track being a succession of ten deg. curves; she had about 480 tons of load besides her own weight (77 tons). I think the cards are very good, but if I had to build another engine like this, I should make her steamways a trifle larger, yet she is doing as well as we expected."

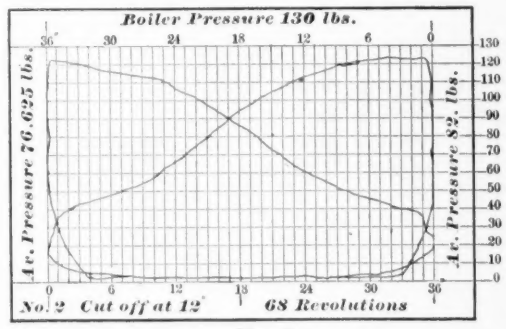
This engine has ten driving wheels connected, and an eight-wheel truck, and she is built with the Stevens' Valve Motion, illustrated in the AMERICAN MACHINIST of August 2, 1883. This motion has a valve at each end of the cylinder, and it opens and shuts the ports much more promptly than a valve actuated by the link motion, features that strongly impress themselves upon the diagrams which show a remarkably fine distribution of steam that is almost equal to the best automatic cut-off engines. The cylinders are 21x36 inches, and the diameter of drivers 57 inches. According to the ordinary traction formula the engine was exerting on the rails the enormous tractive force of over 30,000 pounds, when No. 2 card was taken.




No. 1.




No. 2.




No. 3.

### Lugmayr's Valve Gear.

This valve gear was devised to overcome some of the defects supposed to exist in ordinary reversing valve motions. The leading aim of the inventor of this motion has been to combine simplicity of parts with efficiency of action. An inspection of Fig. 1 will show that a single eccentric is employed which is keyed with the full part of throw exactly opposite the crank pin. The eccentric strap has an arm projecting out having two holes, *X* and *W*. The outer hole W connects with a slide block which moves on the guide *D*. This guide is attached to a rock shaft whose oscillation serves to change the inclination of the guide. The various angles assumed by this guide regulate the points of cut off. When the guide is horizontal or when the reverse lever is in the centre notch, the valve has just enough travel to give the lead, and when the guide is at its greatest angle as shown in Fig. 1, the valve cuts off at full stroke.

Reversing is effected by throwing the lever and guide over to the opposite angle. When the engine is on the center, the four points, *K*, *W*, *X*, *T*, are in line. When in this position the reverse lever can be moved to all points of cut off and from forward to back gear without changing the valve's position, which indicates that the lead is constant at all points of cut-off. The claim is made for the motion that it opens and closes the valve with remarkable rapidity giving prompt opening and closure.

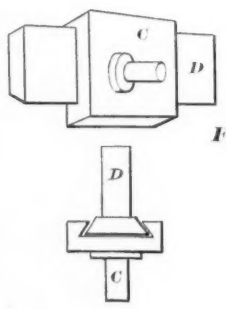
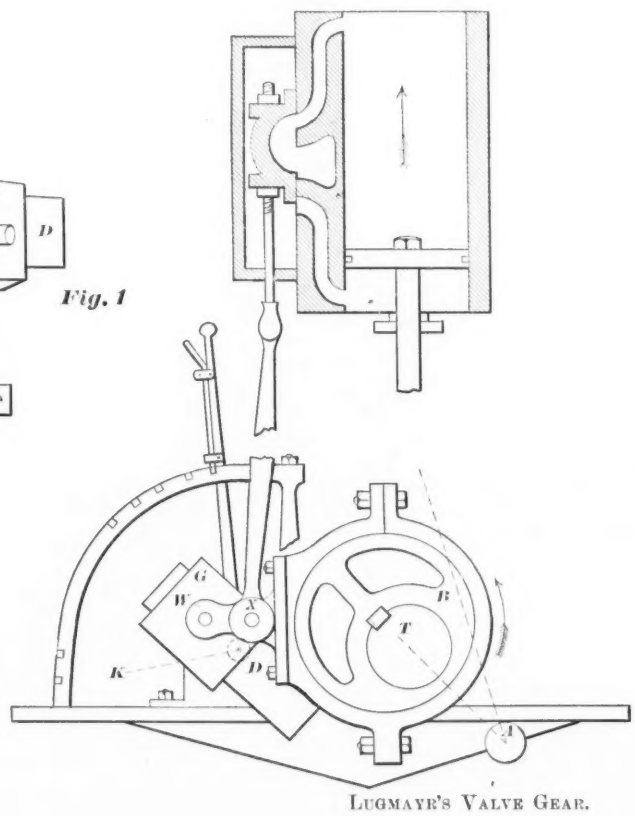



*Fig. 1*




LUGMAYR'S VALVE GEAR.

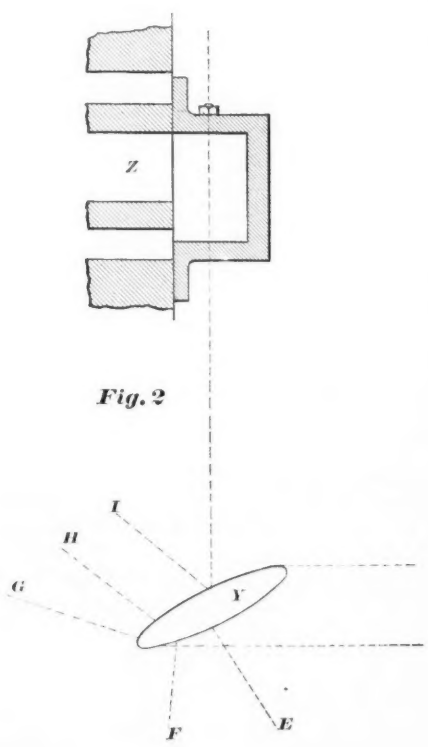



*Fig. 2*

Mr. John Grime, maker of machinists' and engineers' tools, Minneapolis, Minn., constructed an engine with the Lugmayr Valve Gear to give it a practical test. The motion curve in Fig. 2 was taken from this engine and demonstrates that the valve's movement tends to produce an excellent distribution of steam. Several indicator cards taken from the engine running at high speed indicate a prompt full opening, quick cut-off, and clean release free from back pressure. The engine, which is of the marine type, will be at the Exhibition at New Orleans between columns D and D D 47 and 48. The motion is said to run smoothly and reverse easily.

### Accommodations for Visitors to the New Orleans Exposition.

The following is given by the Savannah *News* on the authority of D. C. Bacon, Commissioner from Georgia:

"I have hundreds of letters from persons asking how they could get accommodations at New Orleans, and at what prices. I took the trouble, when I was there, to call at the Department of Information and Accommodations, and fully posted myself. I found its organization perfect. It is located directly opposite St. Charles Hotel, and comprises two immense offices arranged like a hotel corridor. There are a dozen or more clerks employed to direct the details of the work. The department is under the supervision of Mr. B. T. Walshe.

"A canvass of the city has been made, and a list of every boarding and lodging-house and hotel has been secured. A contract has been made with each of them that they will charge a certain price as a maximum during the entire period of the Exposition. These contracts are on file in the department. A stranger goes there, examines one of them, finds exactly what sort of a house it is, how many rooms in it, how many beds in a room, which way the rooms front, how many meals a day, and at what price. He selects his boarding-house, is given a ticket, goes to it, and is protected thoroughly against extortionate charges by the contract made between the owner of the house and the Exposition Company. These prices are very low. Furnished rooms will be from 75 cents a day to $1.50 a day. Boarding and lodging will be from $1.50 to $3 per day. The hotels will charge their regular rates—the St. Charles $4, and the others from $2 to $3 per day. The new Hotel Royal, conducted on the European plan, will accommodate its guests with rooms from $1 per day up to $8 and $10. The new hotels in course of erection in the vicinity of the Exposition grounds will also charge from $2 to $3 per day. These rates will be maintained all through the Exposition, and there may be no fear of extortion or overcrowding."

One of the greatest sources of expense connected with the Bessemer steel converter has always been the burning out of the lining. It has been found practically impossible to find material refractory enough to resist the intense heat of the steel in forming operation. An English metallurgist is one of the latest laborers in searching for a material adapted for the lining of converters, and he has patented a mixture of chrome iron ore as suitable for the purpose. This one is a compound of ferrous oxide and chromium sesquioxide, and is intensely refractory.

### Selecting and Using Files.

BY JAMES F. HOBART.

How many machinists know a good file when they see it? I don't believe one in fifty can take a pile of files and pick out the best one. The average man will pick up two or three, turn them over, squint along the corners, pick out the straightest one and call it as "good as any." They don't seem to have any idea that a file may be soft, or fire-cracked, or burned. If they were choosing a cold chisel they would look out for all these things, but "a file is a file" so long as it has teeth and tang.

Talk about certain tools being abused in the machine shop, or in any other shop. What is more abused than a file? No matter what job is on hand, they are expected to take right hold of it and never let go. Hard iron, soft iron, steel or lead, brass, copper or wood, it makes no difference. The file must go at it hammer and tongs. If the job is covered with an eighth of an inch of grease and dirt, it is all the same. The workman uses one corner of the file to scrape off part of it. When he gets the file well filled with oil he tries to wipe it off on a piece of dirty waste, or the leg of his overalls. He succeeds in filling up the remainder of his file, rather than in cleaning it.

If the job is covered with a generous coat of rust, what matter; the file must scrape it off, and then before it would be half worn out by proper usage, it is pitched into a corner, or dumped into a load of lathe chips, and our chap, if he is in a country shop, watches his chance to "cabbage" a new file. Shops having tool rooms where a man is required to return the old file in order to draw a new one, ought to fare better, but they don't—not much. If Dan or Jim can't find ways and means enough to soft-soap or fool the tool-room chap, then they aren't like ordinary machinists, and had better complete their education.

But to choose a good file, just hold it between your eye and the light, point toward you; you can see the cutting edge of every tooth. See if they are all clean, smooth, and sharp. If they are notched, cracked, uneven and irregular, then they belong to a poor file.

Take a directory and find out who makes files. If you find a file with a man's name upon it, who is really making files, then that file is one of his first quality. Seconds and thirds have fancy names stamped on them. It don't pay to buy them. Fourth class files are left without stamping at all, or rather it is not re-stamped with any fancy name. All files are stamped before tempering, but if damaged in any way, the name is ground off, and re-stamped or left blank according to grade.

Look a file all over for fire cracks; hold up to your eye as before, put the point toward the light, and see if it is all one color. If it shows a checkered appearance, it is uneven in temper, hard and soft in spots. Toss the file into the air and strike it with the handle of your pocket-knife, or some other hard substance. If there are any flaws in that file, the ring of the steel will give them away.

Buy large files; they stand recutting better than thin ones. There is not much choice, however, for within the last two years file makers have established a uniform size and weight for the same classes of files.

Machine-cut files are not liked very well by some; it is claimed that they will not do as much work as the hand-cut, but I have used machine-cut files, and didn't know it until afterwards. Somebody is going to make a machine that will cut files better than hand labor can do it. Does it stand to reason that files cannot live in the age of machinery, when almost everything else lives and dies by machinery and is buried in a machine-made coffin, or burned in a cremating machine?

A poor file is not worth a "continental;" they amount to about as much as Fink's lubricator. I remember one chap that came along with a nice looking lot of files. He sold a lot to nearly every shop in town. He sold them "cheap"—he said—but when the boys came to use those files, the cat tumbled out of the bag, and that "agent" was wanted by the boss. The files were nothing but poor iron. They were treated with prussiate of potash, and came out case-hardened a little, and looking nice and clean. I always think of that dodge when I see a man selling a "job lot" of files. Don't buy low-priced files, thinking them cheap; that is unle s your men make scrapers of them as described. If that is what you want them for, the case-hardened ones are just as good as any.

I once made a rule which I have never since broken. When I got a new file I always fitted it with a handle before using. Just try this once, and you will always stick to it. The machinist has, of all men, no excuse for not having handles to his files. Nearly every shop in the United States has a speed lathe connected with it, and handles may be had for the making. If I were bossing a shop, files would be fitted with handles before they left the tool-room. If a man can't get at a speed lathe, let him knock out the live center of his engine lathe, whittle down the end of a pine stick and drive it into the spindle, bring the tail spindle up to it and turn out a handle with a hand-tool.

I remember one old chap in a little country shop, who used to go out to a grist mill which was connected with the same water-power, and get corn cobs for file handles. He would cut off about three inches of the butt end, drive the tang into the pith, and had a handle at once.

I want wooden handles on my files, and ferules on the handles. In almost every shop a piece of brass tubing is to be got hold of, and you can cut off ferules to order. Sometimes I have been driven to make my own ferules. A piece of sheet or hoop iron was cut the right size, rolled up and brazed together. Any "cub" who had been around the shop six weeks used to know how such a job was done, but now lots of jours never even saw it done. Put a little powdered borax in the ferule, with a small piece of soft yellow brass, or brass filings. Hang it on the end of a poker, and heat in the forge until the brass melts; heat gradually, or you may burn the iron as well as melt the brass. Just as quick as the brass melts it will be known by the blue flame. Remove from the fire, cool, and file off superfluous brass. You can finish in the lathe with an old file after it is fitted to the handle. Don't try to get along with three or four handles. Make a handle for each file, and keep them on them. If Tom or Mike wants to borrow a handle "just a minute," send him to the lathe where you made yours and tell him to help himself.

Use a file as well as you do your steel square or straight edge. You would think a man was foolish or crazy if he threw these tools ker-bang into a drawer when he was done with them; but the files go in just like that. Corners are dulled, teeth knocked off, often the file itself is broken. Drop a flat file two feet upon a bench; if it strikes square it breaks every time. I have seen one break into four or five pieces. If a file gets full of grease, put it in a kettle with potash and water, boil an hour, then wash

and brush in clean water, dry, and rub on a little oil. "Almost makes a new file of it," said Dan, as he picked it up and looked it over. Dipping files in sulphuric acid and water seems to sharpen up dull teeth a little. The acid eats off the steel and leaves the tooth sharper. Lay a file away six months, and if it is decently clean the oxygen of the atmosphere eats up the steel in the same manner as the oxygen of the sulphuric acid and water.

These ways, however, don't amount to much. Better let the file-man take your old files and re-cut them. It costs about one-third the price of new files. Some files will stand re-cutting two or three times; these were made from good stock. I have seen them as thin as an "Arkansas hog," but cut as well as when new. If the file has been overheated, it never will pay to re-cut it; drop it into the old iron and charge to profit and loss.

Once in a while a file will get broken, even with the best of care; but, with the knocking about they are subject to, it is a mystery how any of them come out whole. Tell the boys to bring a file to you the very minute they break it. Don't swear over it; it don't help the file any, and that chap won't bring one the next time he breaks it. Have a little bottle of muriate of zinc (zinc dissolved in muriatic acid), and wet the break with it immediately; then heat a soldering iron and tin the ends of the file. Heat the file pretty warm—not enough to start the temper, but rather too hot to hold in the hand. When well tinned and hot, press the two pieces firmly together, squeeze out nearly all the solder, and let the file cool. Trim off the joint, and, if well done, the file will break in another place the next time. It will not pay to solder a file unless it is nearly new. Let it lay a day or two, or, in damp weather, even an hour or two, and you never can mend it so it will stay. Take it the minute it snaps, and you can do what they used to stick a 'prentice on, viz., mend a file.

If you are acquainted with a file-maker, you can sometimes get "damaged" files at a discount. When the damage is caused by tip ends breaking off, etc., it may pay to buy them; but, like a steam engine, it pays to buy the best that is to be had, and, as in the case of a steam engine, it takes a smart man to tell which one that is.

## Pencil Pointer and Paper Weight.

This little device, designed by Keuffel and Esser, 127 Fulton Street, New York, is one that will be appreciated by draftsmen and those using pencils for fine work. It serves the double purpose of a pencil sharpener and paper weight, and has the merit of being at hand when wanted, not getting mislaid on a crowded desk or drawing-board. It is sufficiently heavy not to move while being used, so that the pencil may be sharpened with one hand while the other is engaged, as in holding some drawing implement.

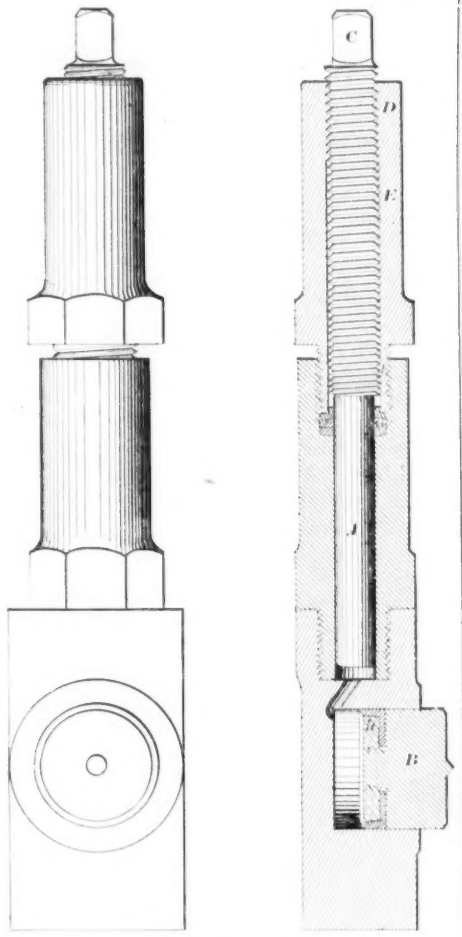
The sand paper is mounted on two rollers and passes over an arched plate at the top and between the rolls. This gives a convex surface upon which to sharpen the pencil, which is much superior to a flat surface for the purpose. When the surface of the paper that is at the top is worn, by means of the button heads shown at the right, the rollers can be turned, bringing a fresh surface to the top. When all the paper is worn a new one is readily mounted.

All the cuttings from the pencil fall into the box which forms the body of the apparatus, so that the hand, paper, or any surroundings do not get soiled. It is neatly made and finished so as to be ornamental as a paper weight; the bottom is cloth-lined.

We have received a pamphlet on "Wire-Wound Guns," by Dr. Woodbridge, which has been published for the purpose of providing authentic information respecting that kind of armament. The author of the pamphlet is inventor of several forms of wire-wound guns which have displayed great durability in hard service. The leading merit claimed for this gun is high strength with light weight. Details given of experiments with wire-wound guns in competition with bronze and iron guns seem to indicate that the former are by far the most efficient for artillery practice that require heavy charges of ammunition.

## Piston Remover.

The accompanying cut represents, in elevation and section, a very convenient hydraulic jack, designed by a Western master mechanic, for removing pistons from cross-heads, or for starting any part of machinery so placed as to be beyond starting by concussion. All master mechanics are aware of the difficulty of removing pistons from the ordinary crosshead, where there is only about two inches of space between the wrist pin and the end of the piston rod. The usual way to start the piston is by hammering a wedge between the wrist pin and piston rod, which, in many cases, produces incipient fractures that ultimately lead to the breakage of the crosshead. This hydraulic jack goes in between wrist pin and piston rod, and produces a ram travel of $\frac{7}{16}$ inch, although $\frac{1}{2}$ inch is sufficient to start any piston. With a lever 12 inches long applied to the screw *C* which operates the jack, one man can apply a pressure of about 12,000 pounds upon the end of the piston rod. The construction of the tool is so obvious from an examination of the cut that a detailed description would be superfluous. The whole tool is made of steel, and leather collars, made in the usual way, are employed as packing for the rams.




PISTON REMOVER.

## Efficiency of Brakes.

BY ANGUS SINCLAIR.

It is surprising how often the worthlessness of certain mechanical devices has to be demonstrated by repeated failure before people all make up their minds to avoid them. Mechanical problems beyond solution appear to possess an irresistible fascination for some minds. What a mountain of lost labor would be accumulated together if all the perpetual motion machines, all the patent car couplers, the type-setting machines, the bumper brakes, and the patent sledge or slipper brakes of an impracticable kind ever invented, were piled into one heap! These reflections were forced upon me the other day by the superintendent of a locomotive company—a bright, intelligent, well-read mechanic—telling me that he was going to use a form of rail brake as a substitute for the driver brake on locomotives. He repeated the ordinary objections to the driver brake, telling how hard it was on side-rod and driving-box trusses, and the belief was expressed that a good form of rail brake could be designed that would do retarding work equal to the brake that is forced up between the drivers, and have none of its disadvantages.

This rail brake was one of the first appliances patented for the purpose of reducing the speed of railroad trains. In 1832 George Stephenson patented in Britain a form of continuous brake, where the retarding power might be applied through blocks impressed on the wheels or sledge shoes applied to the rails. This proved a failure, although the whole mechanical talent connected with the Stephensons' works was used in attempts to develop whatever merit the brake possessed. Failure in such a prominent quarter did not, however, prevent others from trying to succeed with the same device. The rail brake, in various forms, has been a candidate for the patronage of railroad managers at short intervals ever since it vanquished the Stephensons. A favorite form of improvement on this brake was providing it with the means of grasping the rail. In its plain form the insurmountable objection to the rail brake is its deficiency in retarding power; when a grip attachment was added, the brake became a source of danger through the liability of the shoe to get broken off, and in such a case it would generally throw the wheel from the rail.

PENCIL POINTER AND PAPER WEIGHT.

Ever since railway trains were first operated, observing train men have been aware that the retarding effect of a brake was diminished when the wheels were permitted to slide on the rails; but among those not experienced in actual train operating an impression prevailed that the greatest effort towards making a quick stop was to stop the wheels revolving. Only a few years ago, during a discussion on train brakes in a meeting of a pretentious British scientific society, an imposing luminary of the engineering world asserted that the most efficient work the best brake could do was to skid the wheels. It was through the labors of George Westinghouse, Jr., of air-brake fame, that accurate data were first obtained on the action of brakes.

Wishing to obtain accurate records of the action of brakes under a variety of conditions, Mr. Westinghouse had a car fitted up with apparatus designed by himself specially for the purpose, and the trials were made on the London, Brighton and South Coast Railway in 1878, Captain Douglas Galton, an engineering expert, aiding in the work. As the American mechanical and railroad world seem to have forgotten the result of these experiments, if they ever learned them, it may be desirable to give a short account of what was done and what was demonstrated.

Three leading questions were used as the basis of investigation: 1st. What is the strain on each brake hanger at every moment after the brakes are applied till the train stops? 2d. What are the best conditions to secure a maximum stopping power? 3d. What are the conditions of maximum frictional resistance between wheel and rail? The results obtained, when the brakes were applied under various conditions, were startling and entirely unexpected. The most curious facts proved were those in connection with the power needed to slide wheels at different velocities, and the loss of retarding effect due to the sliding. When the train was running at a high speed, it took much greater pressure from the brake shoes to slide the wheels than it did when the train was running slow, and the power required to keep the wheels from revolving after they had begun to slide was much less than the power needed to make them begin sliding. At a speed of forty miles an hour, it took a pressure of 6,000 pounds on each brake block to slide the wheels, and the pressure had to be reduced to 500 pounds before the wheels began to rotate, so that about $\frac{1}{12}$ of the pressure required to slide the wheels kept them in that condition. This does not, however, represent the decrease of retardation due to sliding. It was found at the moment sliding commenced the line of resistance ran up like a flash, but immediately came down again, and fell till only about one-third of the resistance indicated by the brake applied to the revolving wheels was obtained with the wheels sliding. These and subsequent experiments established this one-third as the ratio of retardation that sliding wheels bear to wheels revolving with the brakes properly applied. When wheels begin to slide, their action on the rail resembles that of a scraper pushed into a crust of hard iron that grinds off the edge of the scraper. It holds sharply for an instant, and then slips along the surface, meeting with little resistance.

It was found that applying the brake to wheels did not tend to reduce the speed of rotation until the sliding point was almost reached, and that, so soon as the speed of the wheel decreased, through the brake's action, sliding almost immediately ensued. Before these experiments were made, there was a theory that the coefficient of friction between wheel and rail was less at high than at low velocities, but that was proved to be erroneous. Engineers were puzzled for a time to account for the anomaly that such enormous pressure was needed at high velocities to slide the wheels till it was reflected that the inertia of wheels revolving at from 60 to 80 feet per second could only be overcome by the expenditure of great force. The revolving mass of an ordinary car wheel, running at a speed of 60 miles an hour, represents *vis viva* of nearly 25 foot-tons.

These experiments prove that the accepted laws of friction were not so immutable as physical laws ought to be. In fact, they proved more clearly than anything else that the mechanical world knew very little about the laws of friction, and there is good reason to believe that the world is not much wiser in this respect than it was before 1878.

We noticed, last week, some remarkable results obtained with the Haskell multi-charge gun. Since then the experiments have been continued, ending *finally* in disabling the gun. This was not unexpected, as the gun was at the best only an experimental one. Those in charge of the experiments consider that its efficiency has been fully established, and the inventor is sanguine that all difficulties of construction can be readily overcome in the next one.

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NEW YORK, JANUARY 10, 1885.

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## Assistance Needed for Self-Helpers.

We recently received a letter from a machinist, who is at work in a small country town, saying that he was eager to devote his spare time to self-improvement, and he had been trying to study up some of the scientific principles underlying mechanical work, but there being no evening school where assistance could be obtained, he found his progress discouragingly slow, and asked us for suggestions that might aid him. This is a very common case and represents the wants of a great many men who never publish a complaint of the depressing obstacles they encounter at every step in their efforts at self-help. This country boasts with justice of its public school system for the education of youth, but the liberal sentiments that actuated the originators of our school system have not been inherited by their successors, for the school system of to-day is far less efficient in the cause of popular education than it was fifty years ago. Half a century ago, nearly all young men, for several years after going to work, spent part of the year attending school, so that their course of education was protracted through a period of life partly devoted to ordinary labor. They enjoyed the opportunities for continuing school studies during winter, that most of young men in rural districts still are able to avail themselves of. For rural districts our school system continues to be admirable, but the trouble is now, that a large proportion of young Americans no longer reside in rural districts, and the seasons make no difference in their work. Yet our rulers have failed to change the school conditions to adapt them to the needs of those in want of education. Through this omission a large proportion of our artisans enjoy no means of building up on the elementary education that was cut short by their early entry into the workshop or factory. In a few large cities philanthropic private individuals have in a great measure provided for the intellectual destitution brought about by our changing industrial conditions, and in cities like New York, Philadelphia and Boston the neglect of local government towards rising workmen, is not severely felt; but in hundreds of small towns there is no assistance whatever provided for the ambitious young artisan who desires to improve his mind, and study out the philosophy of his business; and in many cases where the attempt is made to provide evening schools for workmen the method and quality of the instruction are so unsuitable that they fail to serve the intended purpose.

Providing the means of education for those who can attend school only in the evening, ought not to be regarded as the duty of private individuals. In the near future our prestige as a manufacturing nation may depend greatly upon the scientific knowledge of our leading workmen, and widespread industrial education is needed to develop this. Where evening schools have been established by local authorities they have in numerous instances proved indicrously inadequate to meet the wants of the class for which they were provided. Teachers for schools of this kind are nearly always selected from the list of day-school instructors. As a rule the teacher who is laboring all day instructing children, is not well adapted for teaching young mechanics, for he seldom has a proper appreciation of their wants and peculiar needs. Were the requirements of young mechanics confined to the lines of study common in day schools, the teachers' labors might be fairly fruitful; but the evening school pupil, though in most cases benefited by a rehearsal of the stereotyped day-school themes, has pressing need for technical instruction which is generally beyond the acquirements of the teacher. So he confines his efforts to imparting information to the young men in elementary branches of English education, and is often amazed at the ignorance of those who are much older than his senior day pupils. Yet the youths who are occasionally densely ignorant of grammatical studies are able to enlighten the teacher on fragmentary portions of applied science. Between teachers and students so situated, cordial relations are not likely to exist very long. Interest languishes on both sides, the attendance falls off, and finally the school is closed with the intimation that the young men of the place do not interest themselves in improving their minds.

In Great Britain where evening schools have been unprecedentedly successful the Government long ago recognized the necessity for teachers being in sympathy with the needs of the taught. In any district where a certain number of pupils could be obtained the Council of Education established an evening school, and teachers were always selected from men having the technical knowledge most needed in a particular school. By this means the technicalities of nearly all trades are taught in evening schools. The system built up in this way has been exceedingly successful and is extending in value every year.

If any communities or individuals in this country are willing to take up this matter of night schools for workmen, so shamefully neglected by our State authorities, they should try the experiment of employing intelligent draughtsmen or technically instructed mechanics for instructors. The graduates of technical schools make excellent teachers for mechanic night schools when they avoid falling into the error of expecting too much from the pupils. We know that the success of the Brooks and other evening schools that are doing valuable work for the rising generation of mechanics has been due, in no small degree, to the intelligent instruction of technical school graduates.

The majority of mechanics do not desire technical knowledge unless it can be obtained without personal or mental exertion, but in nearly every shop there is a small minority of thoughtful industrious men who are eager and willing to work in pursuit of knowledge. This is the class from which our industrial leaders of the past have sprung; and the same source will provide the leaders in the world's future triumphs of peaceful industry.

To the young men residing in localities where no aid can be obtained to establish evening schools we would say, join together in a mutual improvement club and set to work one helping the other. Surprising progress can be made in this way. One of the most successful mechanics' institutes in Great Britain was originated by a few mechanics combining to help each other in the pursuit of knowledge adapted to their several callings. American mechanics can combine in the same way, and reap similar benefits. One may be beyond his fellows in acquaintance with drawing, which he can impart to the others; another may be well versed in figures; while a third is able to lead the way with studies in physical science. Those who engage in self-help of this character will find that the teacher learns quite as much as the taught. For machinists and engineers excellent assistance may be obtained from using a work like some of the engineers and mechanics' pocket books, as a text book. The advantage of using such a book is that every step made by a learner can be done on engineering stepping stones. Those who need to work on arithmetic, can have their sums made to prove problems of mechanical interest, such as the weight of certain dimensions of iron, copper or other metals; specific gravity, the strength of materials, hydraulics, heat and numerous other subjects provide the basis of sums that are specially interesting to mechanics, because the calculations apply to matters of practical utility. The treatises on mechanics, friction, hydraulics, strength of materials, heat and other subjects that aspiring mechanics ought to be familiar with are handled so simply and clearly that very little labor is required to understand them. Applying one's mind to these studies with determination is half the battle, and it is surprising how difficulties disappear before persevering labor. Self-denial and perseverance are necessary to those who pursue knowledge under difficulties, but the reward is worthy of the labor.

## Opposition to Free Trade in England.

The *Northern Evening Express*, of Newcastle-upon-Tyne, England, does not seem to be enthusiastic for the continuation of the free trade system in that country. In its issue of November 19 we find the following:

The United States has had some experience of free trade and protection, and an historical retrospect of the different experiences of the country under the two systems is altogether in favor of protection, at least according to the opinion of Cooper, the great philanthropist of America, who, a few months before his death, sent a pamphlet to the Tariff Commission then sitting. An extract from that communication is commended to the workingmen of the United States by the AMERICAN MACHINIST, and the extract has considerable significance.

Here follows the extract from Peter Cooper's pamphlet, which we published in our issue of October 18. In commenting upon this the *Express* says:

This is a singular record, if true, and it would not have been presented to the Tariff Committee unless its facts and figures would bear the test of inquiry and of history. A reference to the tariffs and the panics that have occurred in that country bear out the statement of Mr. Cooper; and his record might be continued. The country since then has passed through the experience of war with an enormous national debt, and with a steadily increasing and almost prohibitive tariff, since the Morrill tariff passed in 1861, which nearly prohibited commerce in England. And yet more prosperous and progressive has the country been, and the national debt is being paid off at a rate that proves that it is only a "flea bite," to use Lord Beaconfield's phrase in regard to our national debt. If such be the experience of the Americans, no wonder they are strong protectionists, and that the free traders dare not express their opinions during the late Presidential contest. The above statement is certainly an extraordinary one, and against all that free traders expect as the result of their doctrine of buying in the cheapest market and selling in the dearest. The doctrine is that it is better to make or grow what you want than to buy it, however cheap, of your neighbor; and the only freedom of trade should be with your own States and colonies—a hint that English politicians might take.

The English free trade policy was adopted with the belief that other commercial nations would follow her lead by adopting the same policy. The result has not been altogether satisfactory, especially as regards our own country. Free trade was indeed tried in the United States three times, but commercial disaster followed every trial. By free trade we do not mean an abandonment of all customs duties, but a tariff levied for no other purpose than to raise revenue. That is what the English tariff is. Under it, tea and coffee, being largely used, pay a large amount of duties. In America there is no tariff upon tea or coffee. Our national policy is to exempt from tariff all articles not produced in this country, and which cannot be produced here.

The protective tariffs of France, Germany and Russia keep a large portion of English products out of those countries, because their people are establishing home manufactures. The British Board of Trade returns show that during November exports decreased, as compared with the same month of the previous year, £2 350,000. Part of the decrease is undoubtedly owing to depression in business in most countries of the world. But even when business revives and manufacturing industries are well established in protective countries, how can British manufacturers expect to recover the trade they have lost? Their only hope is to break down our protective tariff and sell their surplus to the United States, the best market in the world. In this effort they are aided by a certain class of newspapers and legislators in this country.

## Miscalculating Train Resistances.

In the description on another page of the locomotive built by the Baldwin Locomotive Works for Morgan's Louisiana and Texas Railroad, we give some calculations of the power needed to haul a heavy train, made by officers of the railroad named. They estimate that the train resistance at a low speed amounted to 7 pounds per ton, and to

make the engine haul the train they had to calculate that, with a boiler pressure of 130 pounds, the engine utilized 127 pounds in the cylinders. This would be a most extraordinary performance for a locomotive with link motion. The highest mean effective pressure we have ever seen made use of, with a link motion locomotive carrying 130 pounds of steam, was 113 pounds, as shown by indicator diagram. This was about 87 per cent. of the boiler pressure, and was quite high. The largest diagram, reproduced on page 5, taken from the Stevens locomotive, shows a mean effective pressure of 114.87 pounds, which is over 88 per cent. of the boiler pressure, but that motion admits of work not produced with the link motion.

The locomotive used by the Louisiana and Texas people to pull their exceptionally heavy train was no doubt very efficient, but we believe the officers are mistaken in thinking that over 97 per cent. of the boiler pressure was used in the cylinders. They make the average of train resistance far too high when they place it at 7 pounds to the ton. If they try a similar train in summer, and use a dynamometer on the draw-bar, we believe they will find the train resistance to be under 5 pounds per ton. Their mistake is the result of false teaching, due to formulas of train resistance based on insufficient data.

### Literary Notes.

*Calvert's Mechanics' Almanac and Workshop Companion* for 1885 is before us. This is the twelfth year of publication of the almanac, and it has attained a large circulation among mechanics. The almanac part is not of much importance, but the articles on mechanical matters are well worth reading and preserving. The issue for 1885 has a number of good stories in the mechanical line. One of these we shall copy next week. Price of the Almanac, 17 cents, post-paid. J. A. Gardner, 132 Broome Street, New York, supplies this publication for the United States.

## Questions and Answers.

*Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.*

*Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.*

(11) P. A. D., Washington, Del., asks: What is the diameter of a circle equal in area to a square that is ¼″ on a side? *A.*—0.282 + inch. The figures given by you are either misquoted or meaningless.

(12) H. B. P., Easton, Pa., asks: Which would be the better as an air chamber in water pipe, one made by sudden enlargement of the pipe or one of the usual form, rising from the pipe? *A.*—The usual form.

(13) R. G., Ontario, writes: In passing a cord around a drum to lift a weight I find one turn not sufficient, and take two turns, one end being attached to the weight while I hold the other end in my hand. Does taking the second turn increase the leverage, or does it increase the friction? *A.*—The leverage is not increased. It is purely a matter of friction.

(14) E. B. C., Pontiac, Mich., asks: Given a locomotive cylinder, 15⅜ inches diameter, solid piston 15¼ inches diameter, two sprung-over rings ⅝″x⅝″, groove cut in piston 11-16″ deep. When the engine is running, using steam, will the steam that goes in under the rings to set them out hold the piston centrally in the cylinder, or will the tendency of the piston be to drag on the bottom of the cylinder? *A.*—The steam under the rings will have no effect to hold the piston up.

(15) H. E. W., Cairo, Ill., writes: I had occasion to examine an engine 16″x24″, at work in a sawmill. Steam is worked full stroke, and the engine pounds badly. I reasoned with the engineer that by using a valve with lap to cut-off at ¾ stroke, and compress up to about ⅔ boiler pressure, he would both gain power and save steam. He says no. Which is right? *A.*—The capacity of the engine would not be increased by the plan you propose, but if large enough for the work it should run smoother and do the work with less steam.

(16) A. ——, writes: 1. The head of a 30″ cylinder is 1⅛″ thick. The initial pressure is 75 lbs. I notice the head springs every stroke from 1-64″ to 1-32″, but do not see that there is any difference in the springing whether the initial pressure is 50 lbs. or 70 lbs. Do you think the head safe? *A.*—If the head is of good iron it is probably quite safe. 2. What is the average tensile and crushing strength of cast iron? *A.*—Tensile strength about 20,000 lbs, crushing strength about 120,000 lbs., to the square inch. 3. What is meant by red short and cold short iron? *A.*—Red short plate is brittle if bent while hot; cold short is brittle if bent while cold. 4. Will you give a reliable rule for calculating the water consumption from indicator diagrams? *A.*—See AMERICAN MACHINIST of March 1, 1884.

(17) J. T., Vail, Iowa, writes: I am about to put in a 35-horse-power boiler. Bricks are very dear here. Would a boiler of the locomotive type be as economical as a return tubular, and what are the objections to the locomotive type of boiler for stationary use? *A.*—The locomotive boiler for stationary use is not considered quite as economical in the use of fuel as the return tubular, but if large enough, so that combustion may be slow, they give very good results in this respect. Other objections are that they are more likely to fail in parts where repairs are difficult and expensive, also that so large a surplus of water cannot be carried in them, and hence they require closer attention in this respect. In case of low water the locomotive boiler is likely to suffer more seriously than the return tubular, and under this condition there is rather more danger of serious disaster.

## Business Specials.

*Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.*


Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Power Measured—F. Van Winkle, mechanical engineer, 22 Cortlandt street, New York.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Locomotive Engine Running. By Angus Sinclair. Price, $2. A handsome, interesting book. Just the thing for a holiday gift. Published by John Wiley & Sons, 15 Astor Place, N. Y.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo, handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.


## Manufactures.

It is proposed to establish chain works at Reading, Pa.

The Ann Arbor (Mich.) Agricultural Works were to start up Jan. 1.

The Putnam Machine Company, Fitchburg, Mass., are running on eight hours time.

George F. Davis has started a new carriage and sleigh factory at Waterville, Me.

Boston capitalists are examining the facilities for building a woolen mill at Loredo, Texas.

The Munton Car Wheel Company, of Chicago, capital $150,000, has been incorporated in Chicago.

A new shoe factory has just been completed in Concord, N. H., which will employ 200 to 300 hands.

A mill is to be erected on the site of the old woolen factory at Terry's Bridge, near Thomaston, Conn.

The Deane Steam Pump Company, at Holyoke, Mass., have now employed from 220 to 230 workmen.

It is thought that the Texas & Pacific Railroad will shortly build machine shops at Fort Worth, Texas.

T. K. McFarland, Palestine, Texas, will establish a branch in that city of the Dallas Gas Engine Company.

The Wilcox Manufacturing Company, Aurora, Ill., hardware manufacturers, are about to enlarge their works.

The Raleigh and Gaston R. R. Co. have commenced to lay the foundation for a new foundry at Raleigh, N. C.

All but about 50 men have been discharged from the Howe Sewing Machine Company's Works, Bridgeport, Conn.

The Harrison Safety Boiler Works, of Philadelphia, have sent four of their boilers to the New Orleans Exposition.

The Wilder-Faulkner Company, capital $100,000, has been organized in Louisville, Ky., to manufacture flour mill machinery.

The William Anson Wood Mower and Reaper Works, Youngstown, Ohio, are employing 100 men, and will increase the force in a short time.

Daniel Prosser, of New Albany, Ind., has been investigating the advantages of Paducah, Ky., for a rolling mill, and contemplates erecting one there.

A company is being formed at Wichita Falls, Tex., for the purpose of utilizing the power of Wichita River and establishing manufactures.

Montgomery, Ala, has asked of the State Legislature the privilege of issuing $100,000 of bonds to provide a system of water works, which has been granted.

J. P. M. Laws, assistant engineer of the Mississippi Valley Railroad, is now surveying ground at Vicksburg, Miss., for the proposed machine shops of that road.

Business at the car shops in Laconia, N. H., is improving. An order for several new passenger cars to be completed as soon as possible was recently received.

Mason Machine Works, at Taunton, Mass., commenced to run 28 hours per week until about the middle of January, when it is thought they may increase the time.

P. C. Holmes & Company, Gardiner, Maine, have issued the fifth supplement to their catalogue of bevel gears, and the first supplement to their catalogue of spur gears.

C. H. Oscorn and J. W. Houchin, previously reported as having decided to establish a foundry at Griffin, Ga., are receiving their machinery.—*Baltimore Manufacturers' Gazette.*

The Colliau Furnace Company, of Detroit, is just completing new shops and offices about half a mile south of its old location. The building is 50x108 feet, with a front 3 stories high.

It is reported that the machine shops of the Louisville, New Orleans & Texas Railroad will be located in Memphis, Tenn., if the company is allowed certain privileges asked for.

Mr. Wm. Ritchie has finished the foundry at Battle Creek, Mich., for Bird & Baker. He dug the trenches for the foundation on the 18th of November.—*Grand Rapids Morning Telegram.*

W. H. Sawyer and O. H. Miller, Fort Valley, Ga., are working up the proposed foundry and machine shop reported last week as to be started in that town.—*Baltimore Manufacturers' Record.*

The Columbia Drill Company, Jamestown, N. Y., has closed down for repairs until after January 1. They expect a good business year, and will prepare for it by new machinery and equipment.

The American Brake Company, of St. Louis, has closed a contract with the Chicago & Eastern Illinois railway for equipping all the engines of that road with steam-driver and tender brakes.

The Scientific Mill and Forge Company, of Springfield, Ohio, have just completed an extension to their works 100x50′, two stories in height. They are introducing a new pattern corn-grinding mill.

Reports from Detroit, Mich., agree that a very large portion of the workmen of the industrial establishments of that city are idle. Out of 35 manufacturing establishments only three are prosperous.

The Wildner-Faulkner Company, Louisville, Ky., incorporated with $100,000 capital, will build extensive machine shops in that city to manufacture flour-mill machinery. Edward Wilder is president.

The Co-operative Planing Mill Company is being organized in Chattanooga, Tenn., to build a planing mill; have secured $10,000 subscriptions to stock so far. B. S. Ozias is working up the company.

The Wason Car Works, Springfield, Mass., are having all they can attend to at present in the line of car building, and the prospects of a "hard winter" there are now broken by large orders from several railroads.

The McClellan File Company, East Saginaw, Mich., are looking for a suitable location in Chicago. The capacity of the works will be doubled after removal. About twenty-five machines will be put in the new works.

Cartwright, McCurdy & Co., of Youngstown, O., contemplate either purchasing the Lookout Rolling Mill at Chattanooga, Tenn., or building a mill for manufacturing cotton ties; if the Lookout is purchased it will be changed to suit.

The Amoskeag, Stark, Manchester, and Armory cotton mills, and the Nemuske and Print works at Manchester, N. H., are running full time, and as a rule are selling nearly their usual quantity of goods for this season of the year.

The Cleveland (Ohio) Rolling Mill Company has been manufacturing Bessemer steel hoops, which are made with one roll and one heat from 4-inch billets. They are superior to iron hoops. The new product meets with public favor.

The Presumpscot Water Power Company, of Portland, Me., has just settled the damages resulting from its overflowing land bordering upon Sebago Lake and its tributaries. The whole amount is not far from $22,000, and there were 113 claimants.

A movement is being made toward the establishment of a company for the manufacture of wooden wares at Foxcroft, Mass., and several capitalists will assist in the enterprise. Extension tables are the principal article named for manufacture.

The Lidgerwood Manufacturing Company, New York, has been awarded the gold medal for superior excellence in hoisting engines, boilers, and small stationary engines, at the exhibition of the Massachusetts Charitable Mechanic Association held at Boston.

Chambers Brothers & Company, of Philadelphia, manufacturers of brick machines, have added to their works a new brick building 26x46 feet, and two stories high. They have also put in some new machinery and made other improvements in and around their works.

The last $8,000 of the $50,000 machine shop bonds issued by the City Council of Newark, Ohio, for manufacturing establishments in that city were sold to the highest bidder. This $8,000 was to aid in the construction of the Reine Elevator Ditcher Works.—*Iron Trade Review.*

Among the recent shipments of Dean Brothers Steam Pump Works, Indianapolis, Ind., were two large steam pumps having 20″ steam cylinders, 14″ water cylinders, and 24″ stroke. One went to Muscatine, Iowa, the other to Cloquet, Minn. Each pump can deliver 1,600 gallons per minute.

E. & A. H. Batcheller & Co., North Brookfield, Mass., are employing about 1,000 workmen in their shoe factory at present. They have the largest shoe shop in this country, as when running to their full capacity they give employment to 1,500 employes under one roof.—*Boston Commercial Bulletin.*

There is a strong probability that the Hall rolling mill, in Hubbard, Ohio, which has been idle for several years, will change owners and be started in operation in a short time. Col. Carnes and other capitalists from Sharon, Pa., have offered $30,000 for the plant, payable $2,000 every six months with interest.

The Mowing Machine Company incorporated in Troy, N. Y., a few months ago, propose to begin operations soon, on Starbuck Island. Nelson Davenport is president; Henry Galusha, vice-president, and William Kemp, Jr., secretary and treasurer. Capital stock paid in, $25,000. Machines to be of the Harrington patent.

Parties from Pawtucket, R. I., have been at Woonsocket several days looking at property with the intention of putting in a brass foundry. The old blacksmith shop in the rear of the works and on the property of the American Worsted Company will be refitted for them, and possession will soon be taken of the premises.—*Boston Journal of Commerce.*

The *Industrial World*, of Chicago, says Fred. W. Wolf, of that city, is looking for increased machine shop facilities. On the first of January Mr. Wolf will begin the manufacture of a new German steam engine, entitled, "Sulzer Brothers' expansion-gear cut-off steam engine." It is something after the type of the Corliss engine, and will be made in all sizes.

The Hot Polished Shafting Company, Youngstown, Ohio, are running their works on full time and selling all they can manufacture. They anticipate adding largely to their present works in the spring of 1885, by erecting a large addition to their finishing department, and will also add several important machines, including 1 new straightening machine, 1 new cutting-off machine, 1 new key-seating machine, 1 new centering machine, and 1 new milling machine.

In our November 22d issue we noted the establishment by H. R. Worthington of branch offices in London, Eng., for the sale of Worthington pumping machinery made at the Hydraulic Works, Brooklyn. A separate organization has been formed for this trade, the English corporation being entitled the Worthington Pumping Engine Company, located at 114 Queen Victoria Street, London, E. C. The new venture is meeting with very encouraging success, a number of gratifying sales having already been made, with flattering prospects for the future. The company say that the superior organization of their American manufacturing plant, and the larger output of work per man turned out by ambitious workmen in this country, will enable them to compete advantageously for English trade on American-built machinery.

T. R. Almond, manufacturer of chucks and angular couplings, has moved from 84 Pearl Street, Brooklyn, to 83 and 85 Washington Street. He has about 3,600 square feet of flooring in a new building, and has increased facilities for filling orders for his angular couplings, which are becoming popular.

### Machinists' Supplies and Iron.

NEW YORK, December 25, 1884.

The end of the year, when holiday matters monopolize public attention, can hardly be regarded as a period when the supply trade would start into activity. The trade has been guilty of no such unseasonable anomaly, and its pulse is very weak. Dealers display impatience at being questioned about the condition of trade, and they ring the change of dullness all around.

Iron No new development is seen in the pig iron trade except that quite a few dealers have made contracts for delivery next year on the basis of the recent low prices. The anticipated cut in coal and freight will, it is believed, still further reduce the price of pig, and the probability produces an uncertain feeling. Standard brands of No. 1 X Foundry is quoted $18 to $18.50; No. 2 X, $17 to $17.50; Grey Forge, $14.50 to $15.50.

Scotch Pig—This market is so dull and the demand so light that a Glasgow steamer is reported to have come in with 300 tons of sand ballast through inability of the agents to obtain pig iron at any rate of freight. Values are entirely nominal. Shotts, $21.50 to $21.75; Coltness, $22; Glengarnock, $20.50; Gartsherrie, $21.50 to $22; Summerlee, $21; Carnbroe, $20.50; Langloan, $21.

The market for Regulus has been quiet and demand almost entirely of a retail character. We quote Hallett's 10¼ to 10⅝ cents.

Copper—The market for ingot is badly demoralized. Dealers ask for 11⅛ cents, but there were no bidders at that price. Last week Wilson & Roake, engine builders, Front and Dover Streets, New York, had some 80 tons of old copper for sale, and the best cash offer they got was 9 cents.

Lead—The market for common pig continues dull, with a few jobbing transactions at prices ranging from 3.60 to 3.65 cents.

Tin—A rise in the London market has stiffened our prices somewhat, but they are unsettled. For jobbing lots we quote Banca, 19 cents; Straits and Malacca, 16 40 to 16.50 cents.

## ✻WANTED✻

*"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.*

Situation wanted by experienced draftsman. Address D., Box 10, AM. MACHINIST.

First-class patternmaker is open for engagement January 1st, 1885. Address P. M., AM. MACHINIST.

Wanted—By competent boilermaker, situation as foreman; 25 years experience. Address Boilermaker, Postoffice, South St. Louis, Mo.

Wanted—Position as foundry foreman by a competent man who has held similar place over twelve years. Address X. L., AM. MACHINIST.

Wanted—Position as foundry foreman. Practical, reliable, and temperate. 18 years' experience. Address J. D., Care AM. MACHINIST.

Situation wanted as draughtsman or at office work by one having ten years' experience as machinist, draughtsman, and bookkeeper. R. P. Brown, Room 10, TRIBUNE Bldg., Chicago, Ills.

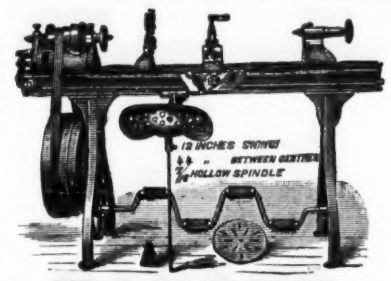
Wanted—A foreman to take charge of machine shop manufacturing stationary engines. Address Box 2, AM. MACHINIST, with references, and state where last employed and what salary expected.

A mechanical draftsman of large experience as designer, with shop experience, wishes an engagement. Would prefer an establishment building steam engines of the Corliss type. Best of references. Address E. C. B., care AM. MACHINIST.

Wanted—Situation as foreman of boiler shop. Understands the business thoroughly. Has large experience on every variety of work, and management of men. Knows how to work men and tools to their full capacity. First-class references. Address Boilermaker, AM. MACHINIST.

Wanted—An experienced foreman for a large machine shop. Class of work, stationary engines and general repairs. Must be thoroughly competent to handle men. Give references, where last worked, age, and salary expected. Address Box 6, AM. MACHINIST.

For Sale—Our Worthington duplex steam pump, nearly new, in perfect order, size 4½ x 2¾ x 4. Will be sold low if applied for soon. Address Wm. H. Clapp, Weymouth, Mass.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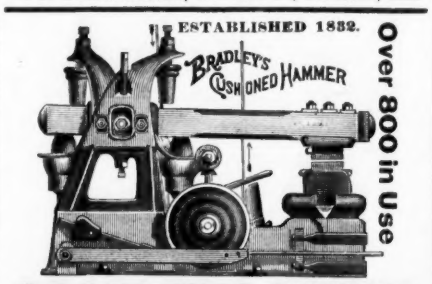
Patent Foot and Steam Power Machinery. Complete outfits for Actual Work-shop Business. Lathes for Wood o Metal. Circular Saws, Formers, Mortisers, Tenoners, etc. etc. Machines on trial if desired. Descriptive Catalogue and Price List free.

W. F. & JOHN BARNES, 1995 Main St., ROCKFORD, ILL.

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Stands to-day without an Equal.
It approaches nearer the action of the Smith's Arm than any Hammer in the WORLD.

BRADLEY & CO., Syracuse, N. Y.

THE BROWN HAMMER
STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises the Hammer
A NEW MOVEMENT! SEND FOR DESCRIPTION.
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FOR SALE
VERY LOW
BEFORE TAKING STOCK.

1 Iron-Frame Circular Saw Table for 14" Saw.
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1 16"x 6' Drill or Speed Lathe.
1 16"x 8' Pattern Maker's "
1 16"x 6' Drill Lathe with Milling Machine attached.
1 24" Stationary-head Upright Drill.

For full particulars call on or address

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Dynamo Electric Machinery:
A Manual for Students of Electrotechnics.
BY SILVANUS P. THOMPSON, B.A., D.Sc.
388 pages, 8vo, cloth, illustrated by 230 engravings.
Price, $5.00.
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TACK & SHOE MACHINERY
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FRICTION CLUTCH PULLEYS,
Hoisting Engines and Hoisting Machinery,
D. FRISBIE & CO.,
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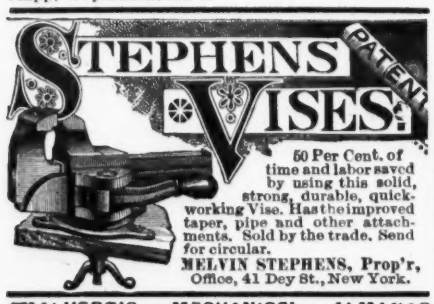


50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.
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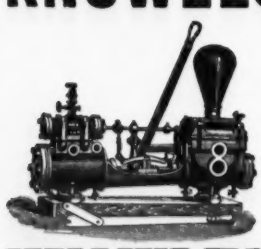
FOR 1885.
Now ready. Invaluable information for Mechanical, Engineering, Building and Constructive Trades. Rules for Cutting Spiral Threads on Disks, Table of Change Wheels for same. Tests for Iron, etc. Price 17 cents, post-paid.
J. A. GARDNER, 46 East 10th St., New York.

KNOWLES PATENT STEAM PUMPS.
THE STANDARD!



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Estimates furnished on application for Pumping Machinery of any capacity, and to work against any pressure.
Air Pumps and Condensers for steam Engines a specialty. Will save from 20 to 30 per cent. fuel.

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98 Liberty St., New York, and 44 Washington St., Boston, Mass.

The Deane Steam Pump Co., HOLYOKE, MASS.
NEW YORK. BOSTON. PHILADELPHIA. CHICAGO. ST. LOUIS.
MANUFACTURE
PUMPING MACHINERY
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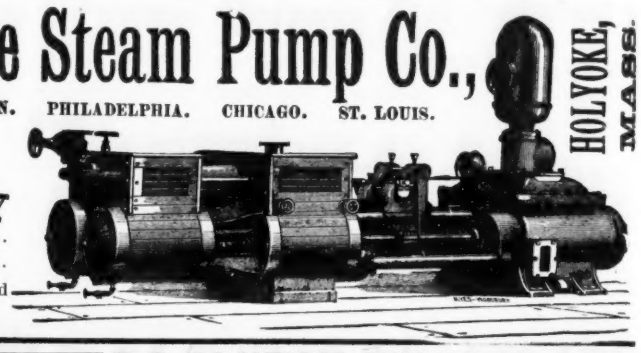

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS.
JAS. HUNTER & SON, North Adams, Mass.

STANDARD TOOL CO., Cleveland, Ohio. { W. A. BABCOCK. Manager.

MILLING MACHINES.
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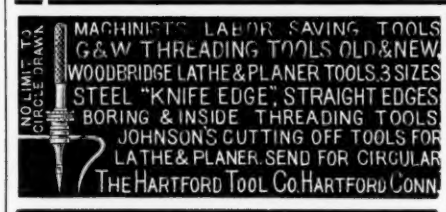


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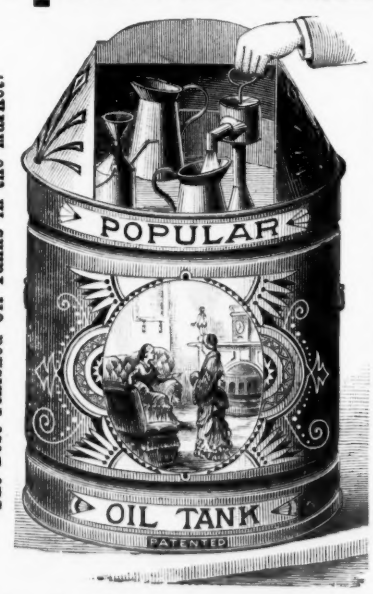


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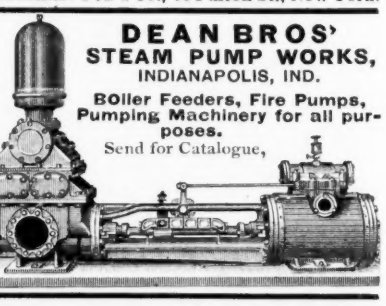

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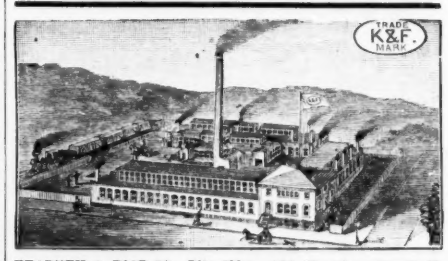


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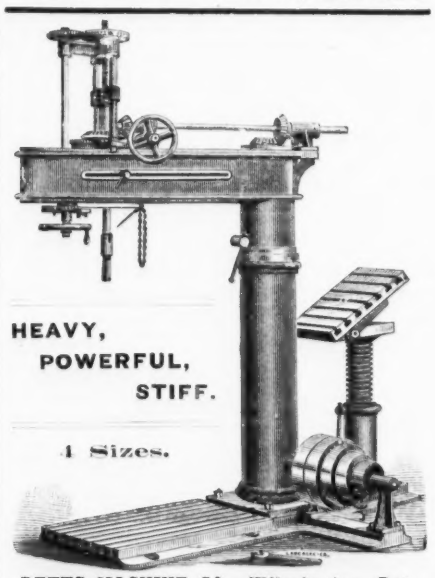

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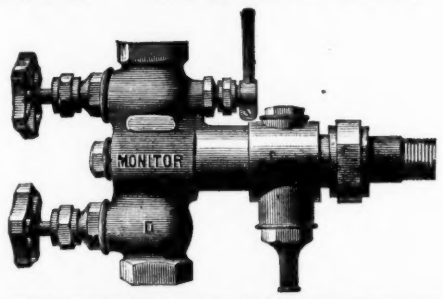


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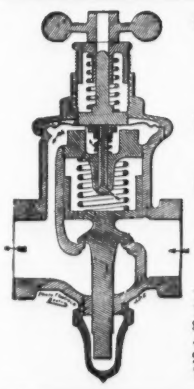

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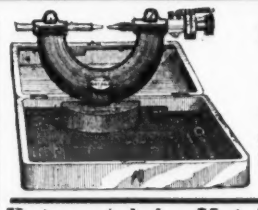

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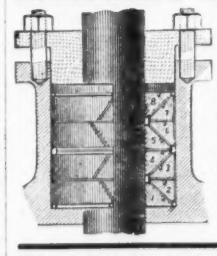

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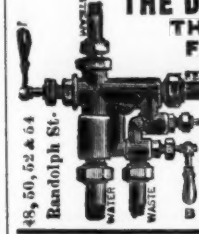

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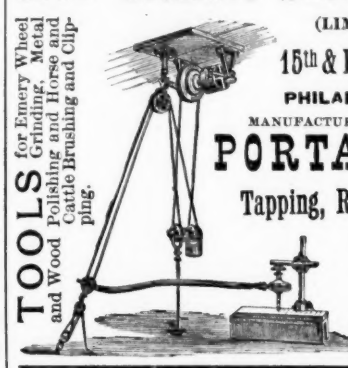

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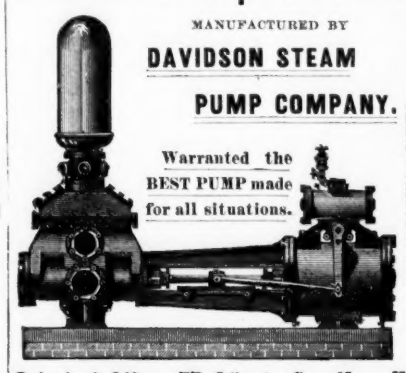

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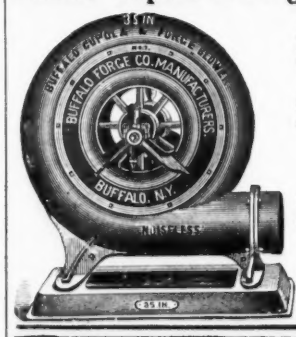


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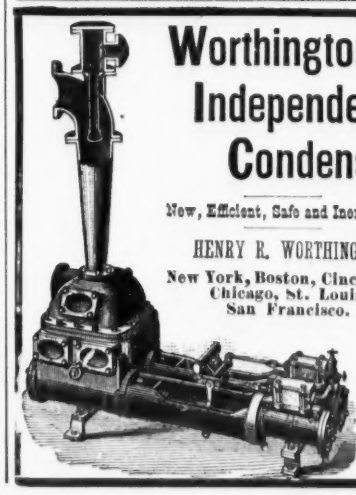

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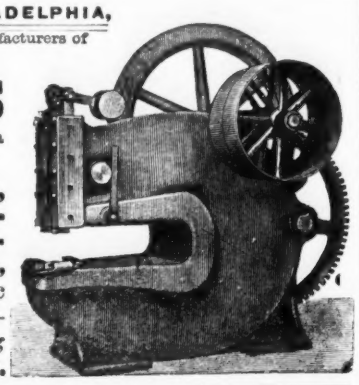

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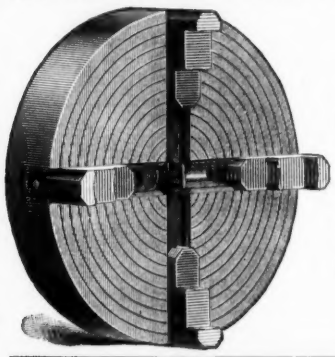

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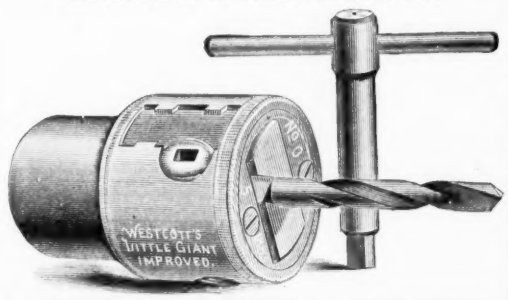


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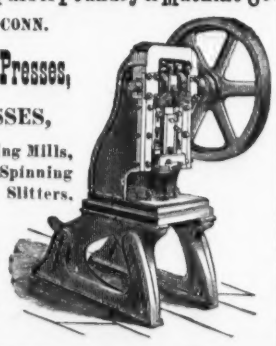

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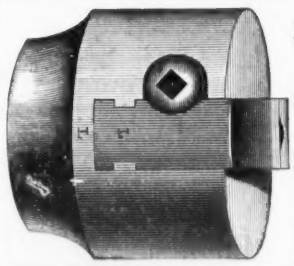

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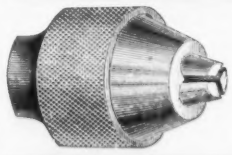

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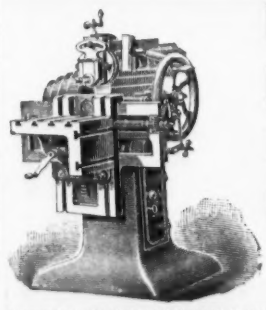

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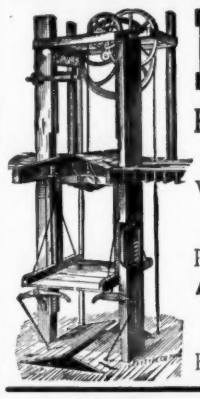

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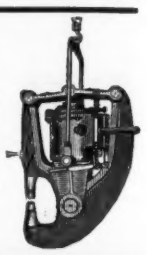

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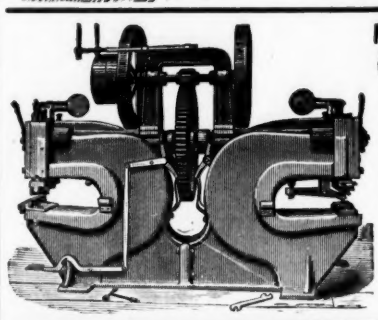

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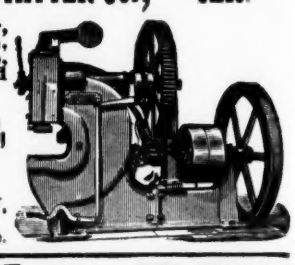

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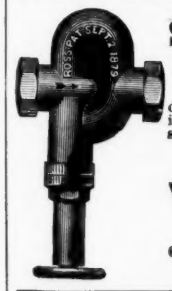

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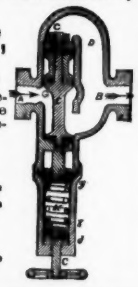

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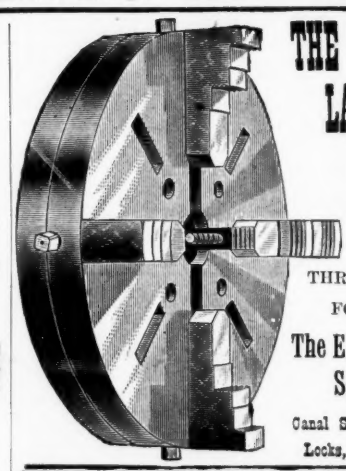

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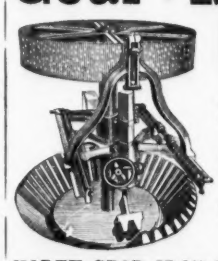

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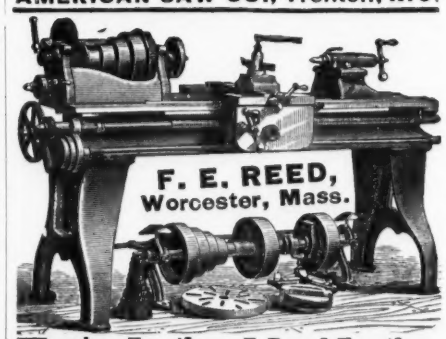

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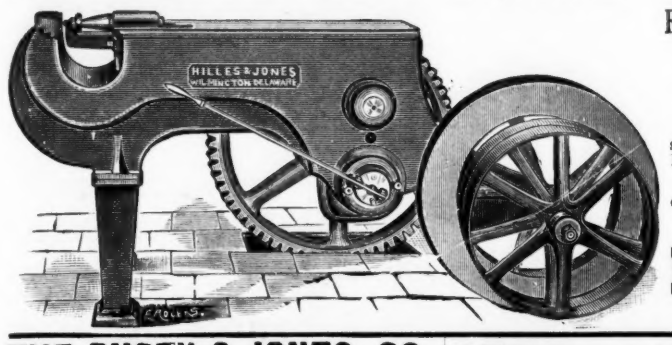


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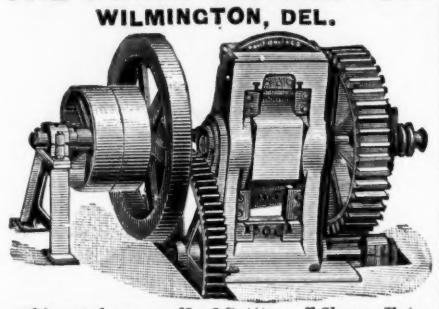

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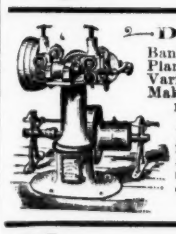

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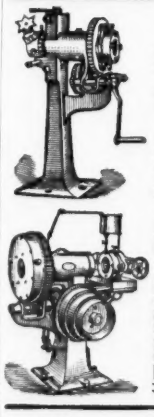

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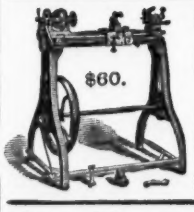


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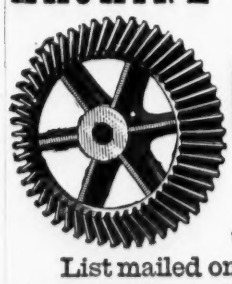

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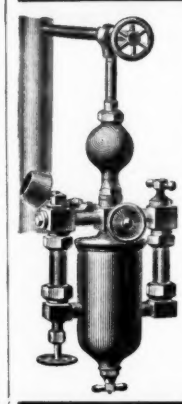

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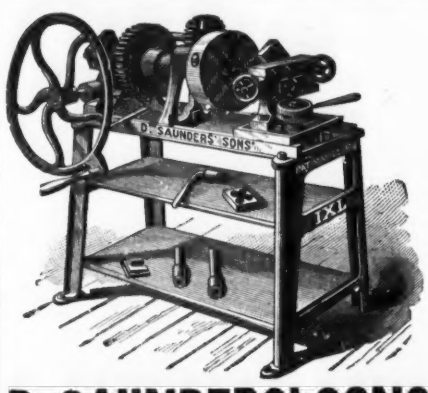


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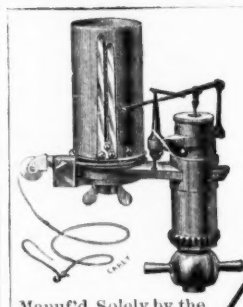

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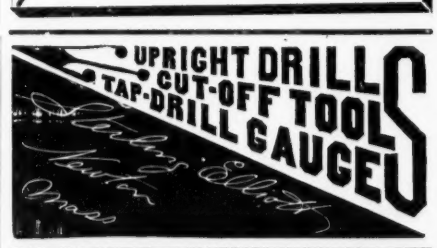


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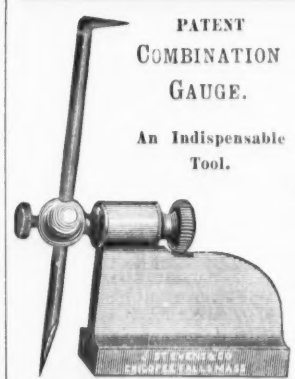

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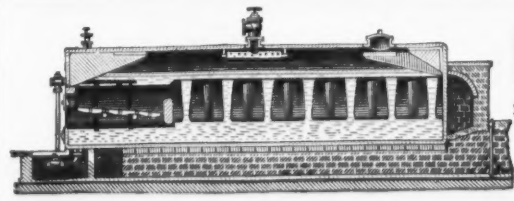

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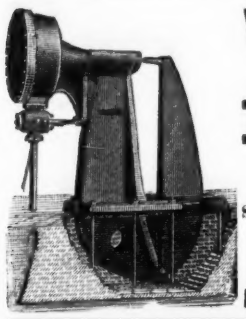

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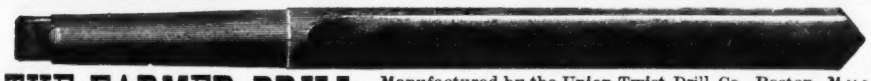

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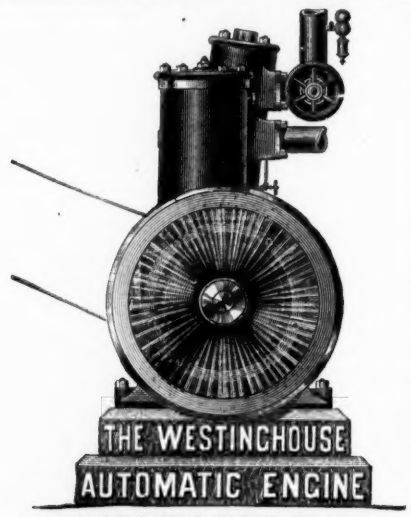


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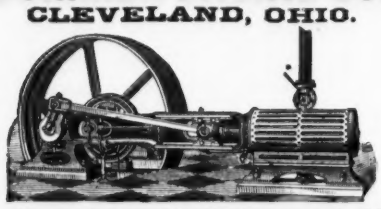

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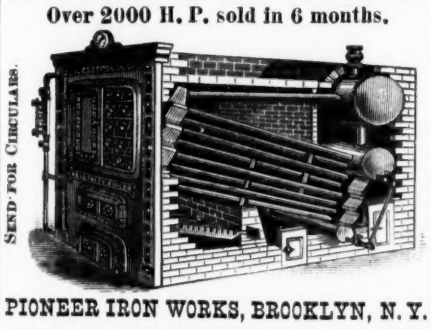

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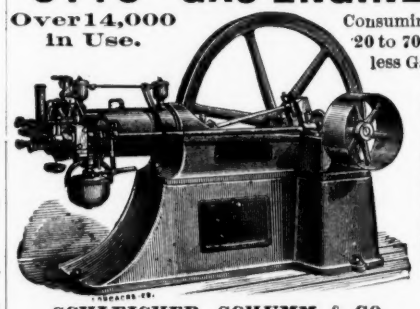

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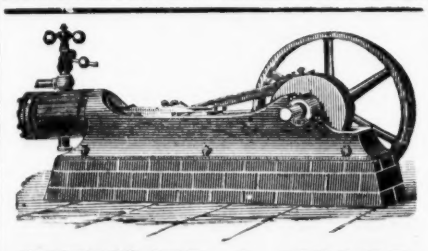

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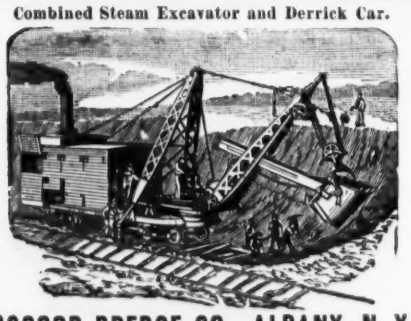

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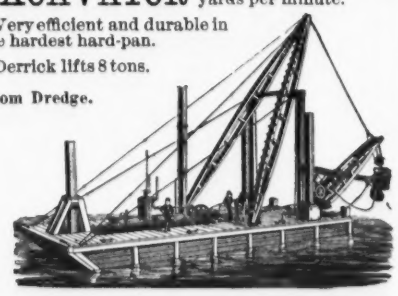

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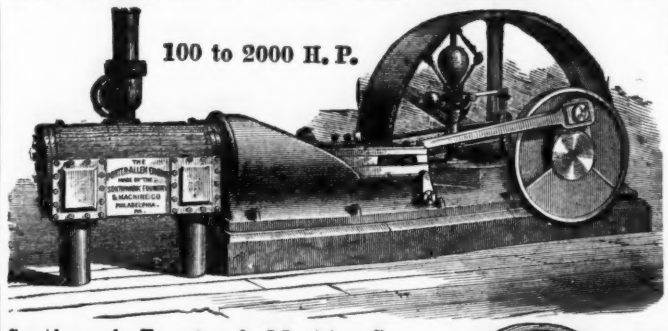

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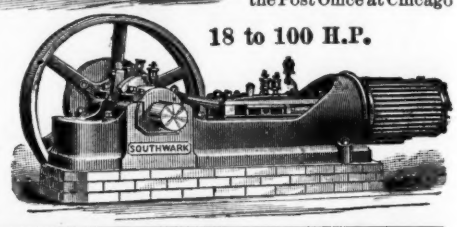


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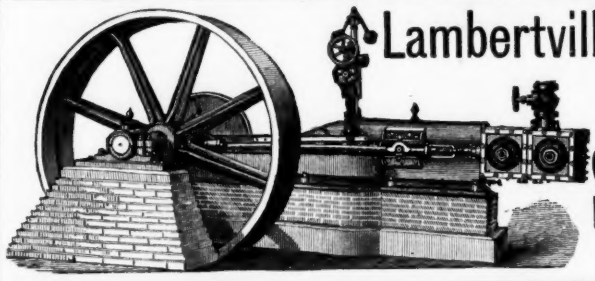
## Lambertville Iron Works,



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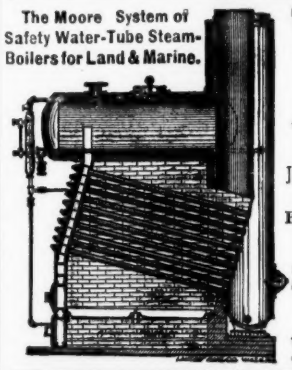

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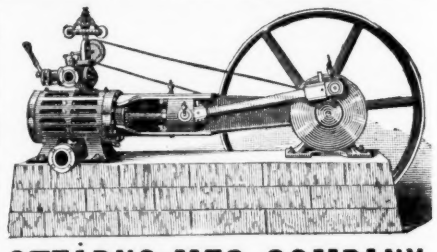

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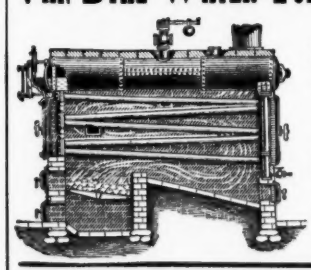

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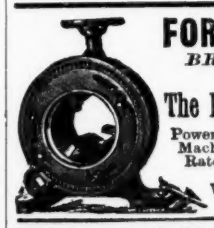

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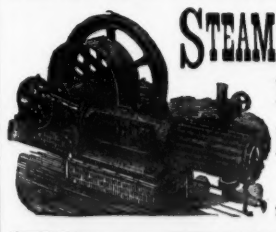

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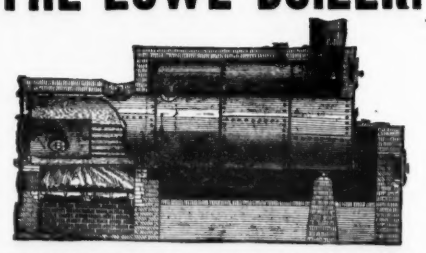

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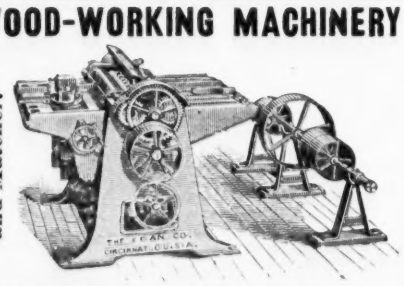

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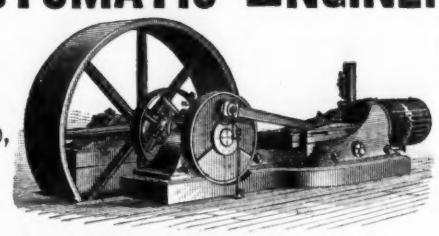

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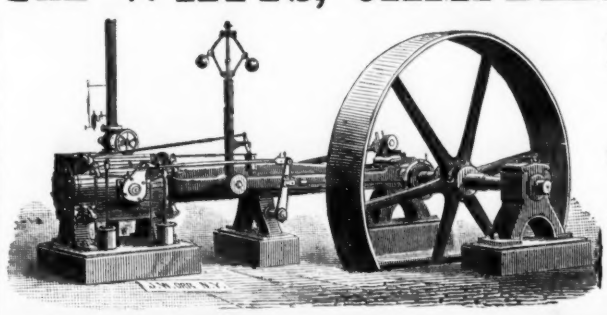

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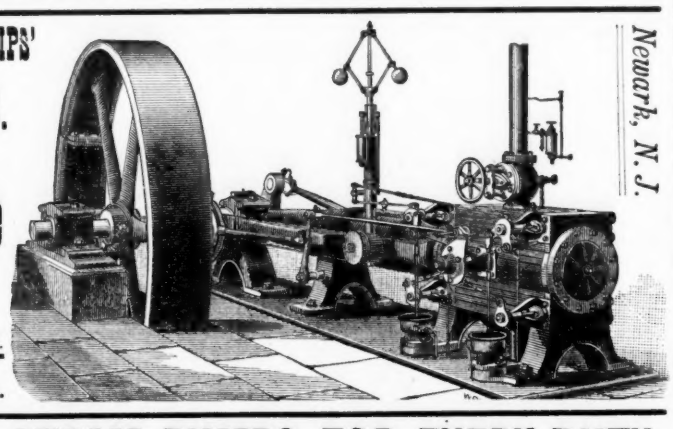

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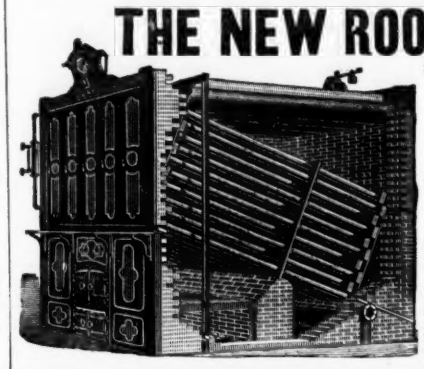

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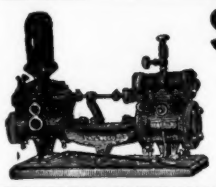

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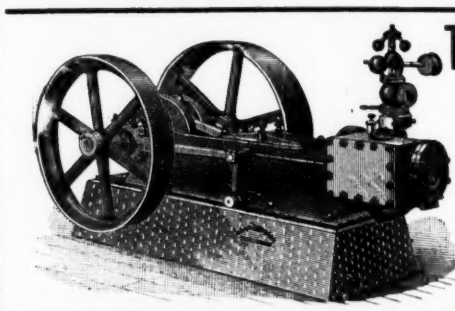

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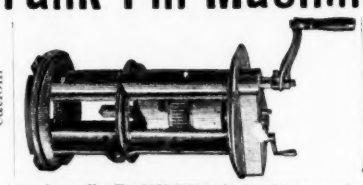

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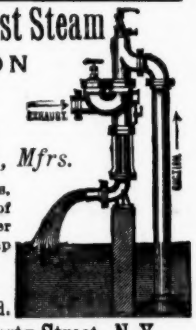

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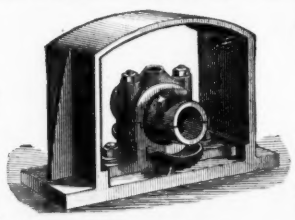

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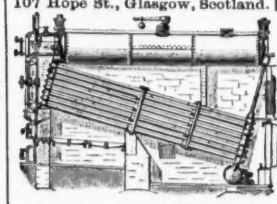

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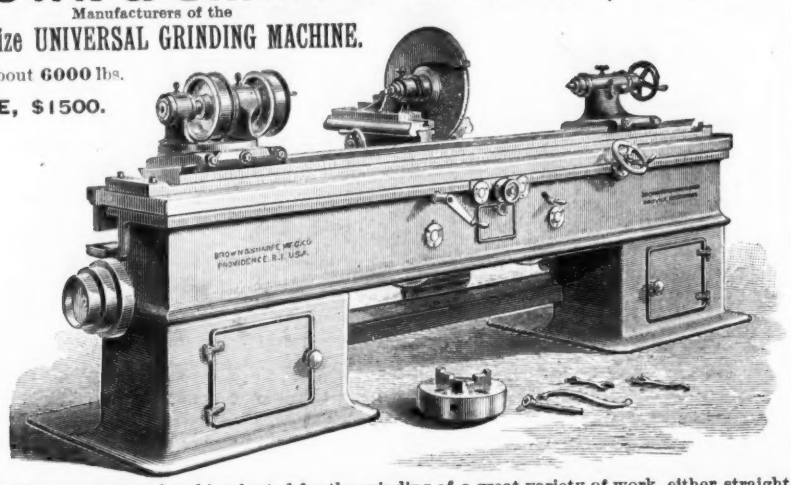

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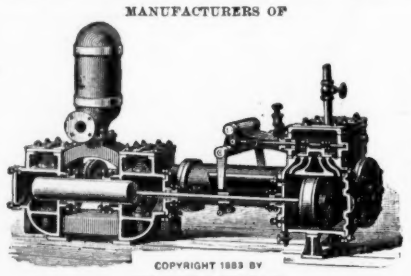

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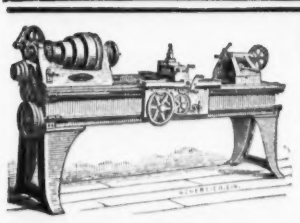

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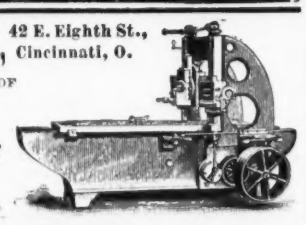

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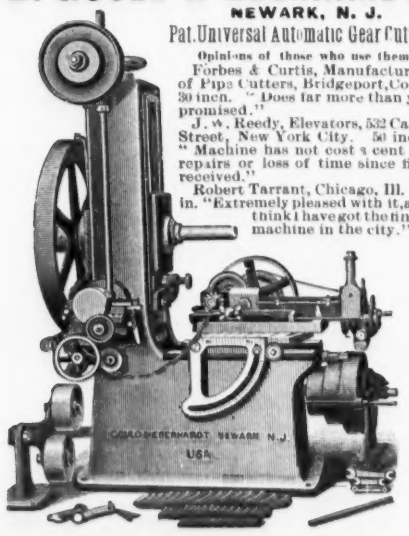

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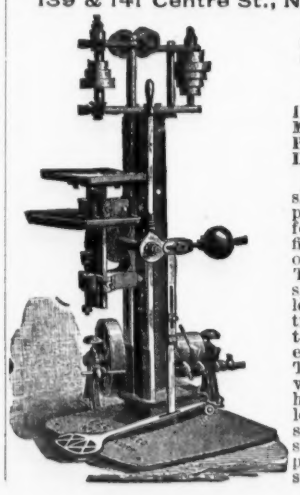

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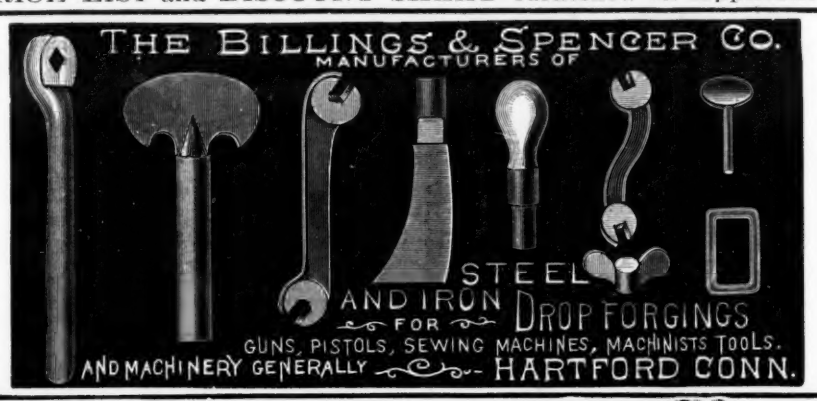

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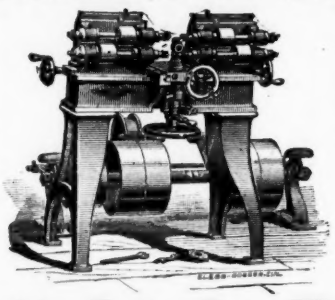

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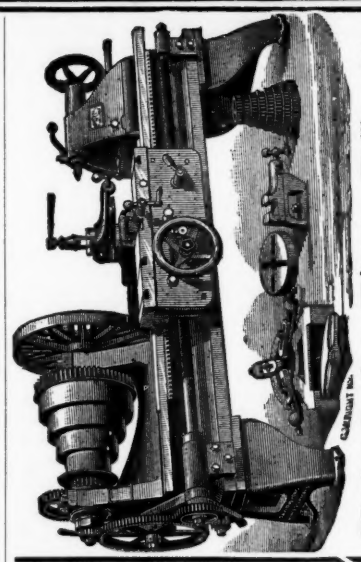

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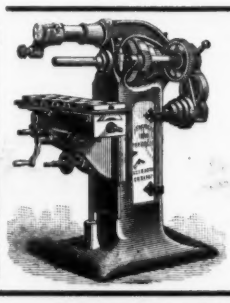

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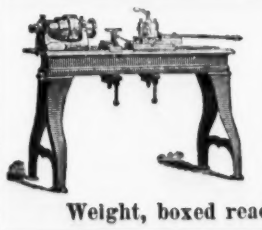

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